McGraw-Hill DIGEST

MARCH 1949

BUSINESS · ENGINEERING · INDUSTRY

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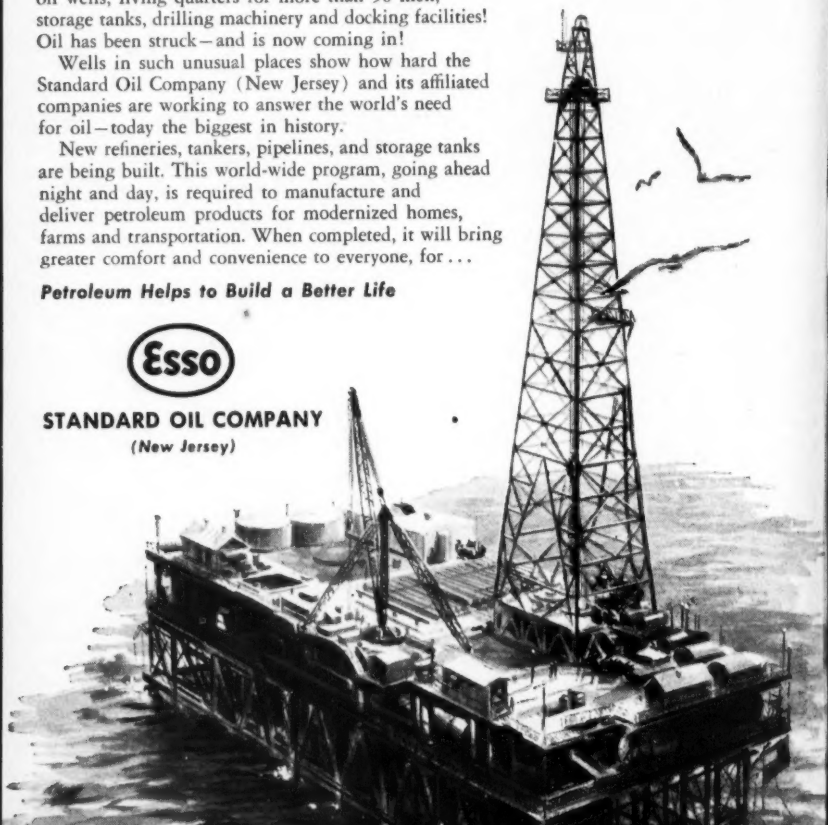

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The data following each of the articles in the McGRAW-HILL DIGEST reveal the name of the publication in which the article originally appeared, the date of the issue, and the page number. Thus, "Am Mach, Mar 24, 128", means that the complete article can be found on page 128, of the March 24th issue, of the American Machinist.

This information provides an invaluable reference source wherever the publication referred to is available. If it is not readily available, you as a subscriber have only to address requests to our editors (within reasonable limits), or to our London office, and tear sheets of the original articles will be sent to you without charge as long as they are available.

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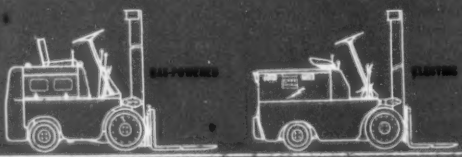

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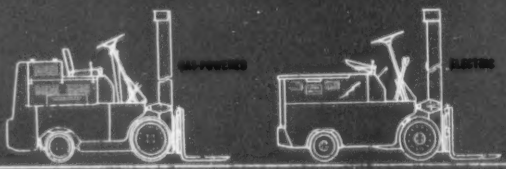

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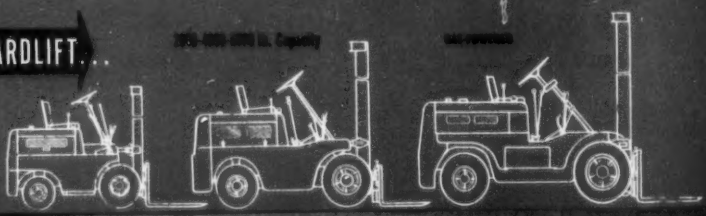

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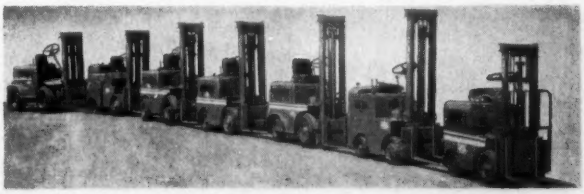

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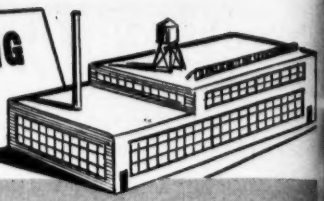

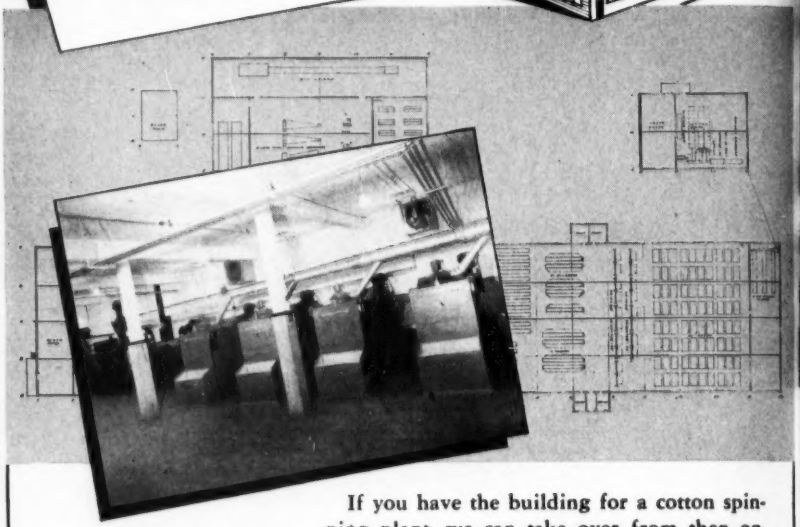

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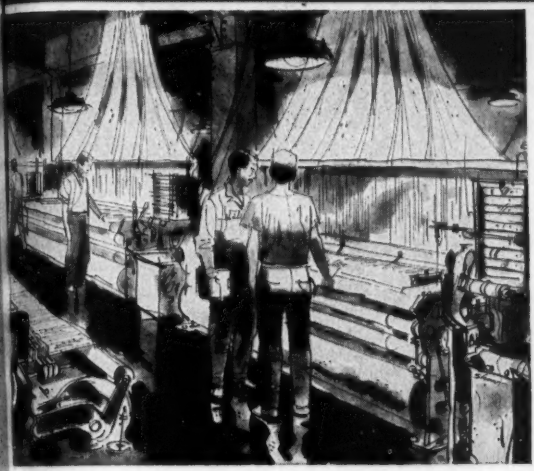

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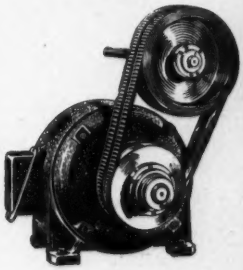

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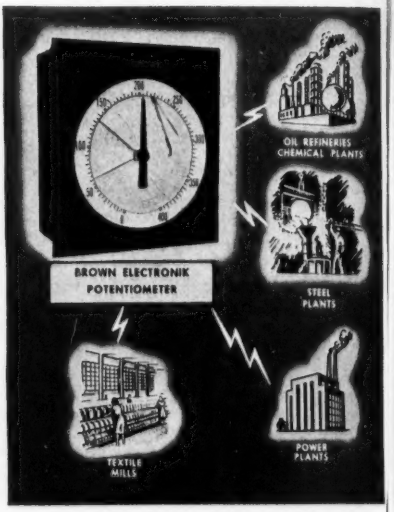

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Business Trends

U. S. FOREIGN TRADE for this year, despite troubled world conditions, is now expected to rise over 1948 export and import figures. Official estimates are $13.5-billion for exports—about 8% above last year—and $8-billion for imports—12% above last year. That would make the export-import gap $5.5-billion, compared with $6-billion in '48 and $9.6-billion in '47.

More money for foreign aid will relieve dollar shortages throughout the world and be chiefy responsible for boosting U. S. exports. For July 1949-50, foreign-aid programs, including Export-Import Bank disbursements, are expected to mount to more than $6-billion. To this figure must be added military aid to western Europe —possibly another billion dollars.

Some export lines will be up, others down. Industrial equipment will be in demand the world over. The end of last year featured a spurt in machine-tool sales abroad. In November, 18½% of total bookings were for export—the highest since April 1947. Practically all ERP nations are in the market. England and Italy are leaders, English emphasis being on special-purpose, mass-production machines.

More farm equipment, moving into better supply, will be available for export, especially lighter equipment as small tractors. Combines, heavy tractors, and other larger items are still in short supply. The $75-million limit for Economic Cooperation Administration purchase will probably be removed.

Export items that will be down are grains, coal, textiles, refrigerators, radios, automobiles. The demand for automobiles remains high, but import controls in many countries will reduce export volume under last year's total of approximately 442,000 passenger cars, trucks, and buses.

Imports into the U. S. will be aided by industrial recovery in Europe and U. S. demand for strategic materials. Stockpiling items in chief demand are rubber, copper, lead, zinc, manganese, and tin. Also needed in large supply are copra, palm oil, tin concentrates, cordage fibers, industrial diamonds, graphite, asbestos, tungsten, and vanadium.

Import physical volume will more than offset anticipated price reductions in imported goods. Even the record import value expected is considered by government officials as lower than it should be. On the basis of the prewar pattern, imports should total at least $10-billion this year, instead of the $8-billion that was forecast.

WESTERN EUROPE'S PROSPECTS after 1952—when the European Recovery Program is scheduled to end—are still in grave doubt. The interim report of the Organization for European Economic Cooperation warned that ERP nations may need from $1-billion to $3-billion a year to balance their trade after 1952.

It is reported from Washington that an unpublished ECA study confirms the

Business Trends (Continued)

OEEC warning and that Europe will need U. S. help long after 1952. This is particularly true for nations that hesitate to cut imports drastically, reduce consumption, and increase exports. France, for example, paid for 61% of its imports out of exports in 1947. Last year, it was 64%. At that slow rate, she will need help long after ERP ends.

Unofficial reports indicate that $100-million may be cut off aid requests from Belgium and Luxembourg for the 1949-50 year. This would mean that these countries would get only conditional grants to cover loans to debtor nations.

EAST-WEST TRADE IN EUROPE, which is essential to the Continent's industrial and business life, was given powerful encouragement by recent signing of a Britain-Poland 5-year trade pact. The agreement calls for a $600-million exchange of goods and exceeds by $150-million the Russian-Polish 5-year pact.

Poland will get machinery, rubber, and wool, but no copper although the Poles asked for it. Britain will get farm products—bacon, eggs, timber. British also succeeded in earmarking about £6-million of Poles' sterling earnings as first payment for British property nationalized by Poland.

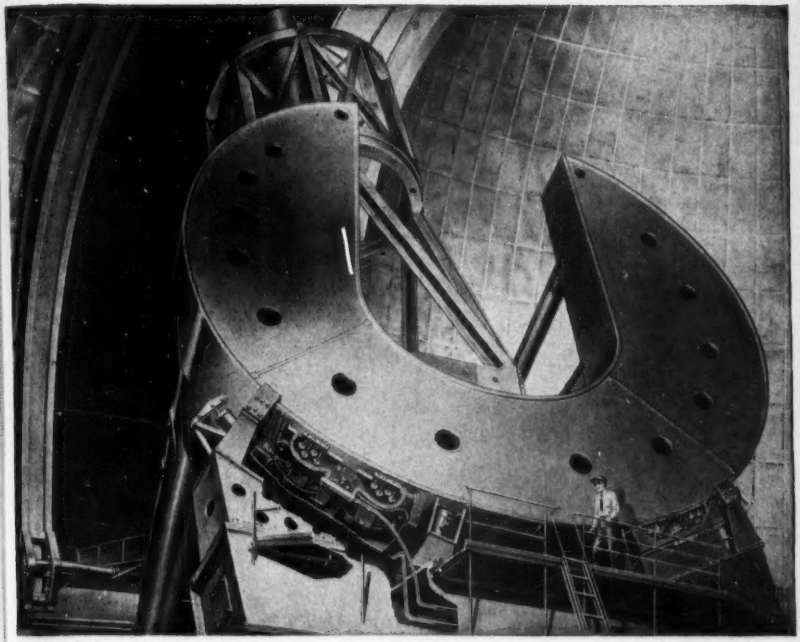
SOUTH KOREA is now slated for a recovery program. The U. S. Army has been sending in relief supplies since liberation. ECA, which took over the Army's aid job the first of the year, plans to switch to the recovery type program.

Engineering consultants are now in Korea surveying economic needs. Their study will help in laying out a specific plan that is expected to call for greater imports of machinery and equipment for coal mines, fertilizer plants, power plants, and the fishing fleet.

BUSINESS CONDITIONS in the U. S. throughout 1949 were forecast as generally good in December and January Business Trends. This forecast is now reinforced by results of a McGraw-Hill survey (see page 41) on capital expenditures planned this year by U. S. industry.

Economists agree that prosperity is geared to industry's investment in new plants and equipment. The planned expenditures for this year, while slightly less than the record-breaking total in 1948, are consistent with a continued high level of business activity.

PRESIDENT TRUMAN, in his inaugural address, called for a "bold new program" to raise living conditions in underdeveloped countries. American technical knowledge will be in demand to help in planning all the projects that will be fostered. To aid in making this knowledge available, McGraw-Hill International Corp. has just completed a survey of engineering firms and consultants engaged in such work in foreign countries. If you have need for engineering service, the McGraw-Hill Digest, on request, will recommend suitable firms or consultants.



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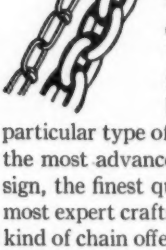

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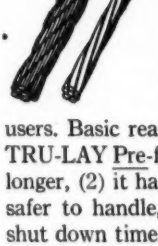

TRU-LAY WIRE ROPE

American Cable TRU-LAY Pre-formed Wire Rope more than meets requirements of contractors, the oil industry and other users. Basic reasons for selection of TRU-LAY Pre-formed are (1) it lasts longer, (2) it handles easier, (3) it is safer to handle, and (4) it reduces shut down time. Illustrated Catalog DH-1305 on request.

ACCO Products Include: AMERICAN Chain • TRU-LAY and LAY-SET Pre-formed Wire Rope • TRU-LAY Cable and TRU-LOC Swaged Terminals for Aircraft • TRU-STOP Emergency Brakes • PAGE Wire, Chain Link Fence and Welding Rods • CAMPBELL Abrasive Cutters • READING-PRATT & CADY Valves and Fittings • READING Steel Castings • PENNSYLVANIA Lawn Mowers • MARYLAND Bolts & Nuts • "ROCKWELL" Hardness Testers • WRIGHT and FORD Hoists • HELICOID Pressure Gages • MANLEY Automotive Service Equipment • OWEN Silent Springs.

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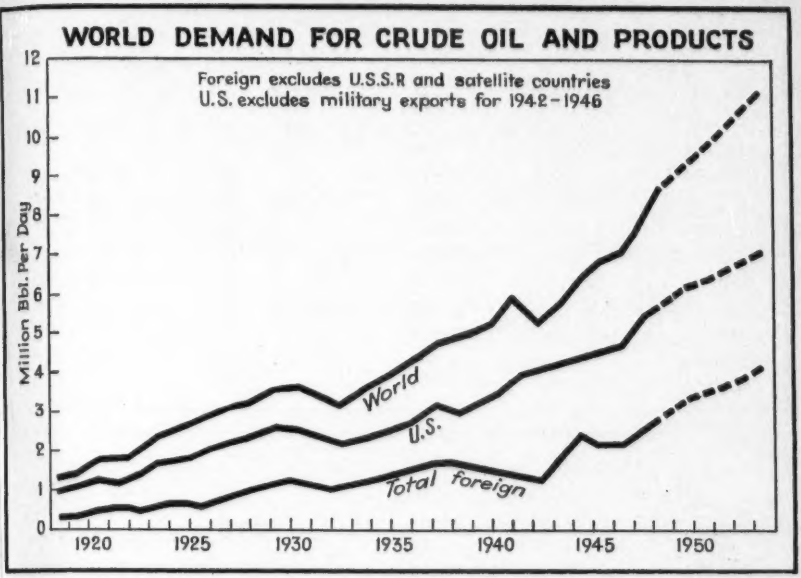


DEMAND for crude oil and products is rising fast as the . . .

World Oil Outlook Brightens

World-wide demand for petroleum products is growing at a rapid pace, creating new problems in discovery, transporting, and refining of oil

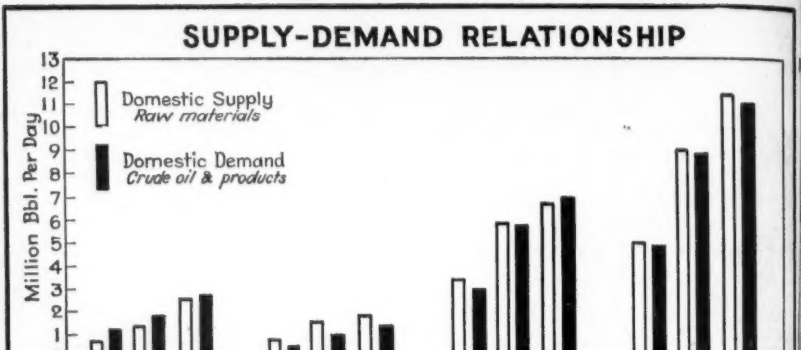
THE WORLD OIL-SUPPLY situation today is better than it was a year ago, and promises to grow even better. The petroleum industry not only has increased capacities for crude-oil production, refining, transporting, and storing, but has also met unprecedented postwar consumer demand.

But the whole supply problem is not entirely solved. Adequate working stocks are yet to be built up in all areas of the world, and the prewar position of a surplus crude production schedule has yet to be achieved once again. The industry must still advocate efficient consumption and conservation—at least until a period of adequate supply is reached.

The past record and the outlook for world demand reflect the postwar achievement—despite the lack of all the needed equipment—and the tremendous tasks still confronting the petroleum industry. As well shown by the world-demand chart, World War II caused a drastic increase in demand; postwar conditions intensified the demand.

The war years of 1940-45 saw a 1½-million bbl. per day increase for crude oil and products—from 5.4-million to 6.9-million. Demand after the war continued to rise to an all-time high in 1948 of 8.82-million bbl. per day.

But in the next 5 years, even larger



OIL SUPPLY with new discoveries and more exploration work being carried on than ever before will more than equal the demand, despite its rapid world-wide rise

world supplies will be needed. The 1953 demand is now estimated at approximately 11.2-million bbl. per day.

How will the world petroleum industry meet this demand for an extra 2.4-million bbl. per day? First, in the United States, it is now foreseen that crude-oil production will continue to rise to 1953 by an annual increment of about 150,000 bbl. per day. At the same time, the supply of natural gas and benzol is expected to rise from 400,000 bbl. per day in '48 to 540,000 bbl. per day in '53.

In this same period, production outside the U. S. (excluding Russia and satellites) will increase even more. Last year, crude-oil production abroad increased substantially, rising from 2.5-million bbl. a day in '47 to 3.1-million bbl. a day in '48. For the 5-year period, production should rise to 4.65-million bbl. a day, or an average yearly gain of about 300,000 bbl. per day.

Important in this picture is the shift in the international flow of oil. The U. S. has reversed from its position as a net exporter of oil to a net importer. Last year, the U. S. imported 474,000 bbl. per day, and in '53 will import an estimated 526,000 bbl. a day.

South America is the logical source for U. S. imports, but that supply is contingent on development of crude-oil resources in the Middle East together with expansion of refining facilities in Europe. Middle East production capacity must be increased, pipe-line transportation provided, and refining facilities expanded to reduce the drain on South America by the countries of the Eastern Hemisphere.

The question of oil reserves logically arises. Proved and indicated reserves as of the first of '49 are just under 80-billion bbl. This oil is distributed about equally between Eastern and Western Hemispheres.

More than a third is in the U. S., (28-billion bbl.), and substantially more than a third in the Middle East (32.6-billion bbl.). South American reserves amount to 10-billion bbl., of which Venezuela alone accounts for 9-billion.

African reserves are estimated at only 122-million bbl., the Far East at 192-million, and the East Indies at 1.2-billion.

European reserves are believed to total 13-billion bbl., the most being in Russia (4.2-billion) with Romania a low second at 350-million bbl.

The estimate for Russia—a matter of speculation—is considered to be too high rather than too low. If Russia is still following an open-flow technology, ratio of proved reserves to actual production is not likely to be as great as that for the U. S.

Russian Production Low

Best available data indicate Russian-controlled countries produced oil at a daily average of 693,000 bbl. last year, a gain of 6% over '47. Comparative figures are 5.5-million bbl. and a 8.4% increase for the U. S. and 3.1-million bbl. and 21.2% for the rest of the world.

Thus, world output of petroleum in '48 averaged about 9.3-million bbl. per day, a gain of 12.1% over '47. Total production for the year was 3.4-billion bbl.

What is being done about petroleum finding, transporting, and refining equipment? Engaged in oil discovery late in '48 were 499 rotary rigs operating outside the U. S., Canada, Germany, and Russian-controlled areas. This figure represents a gain of some 60 rigs or about 13% over late '47 and 31% over the previous year.

Unofficial estimates place the total rigs in Russian-dominated areas at about 600. In the U. S., there are 2,422 rotary rigs in operation. Another 80 rigs are running in Canada. Germany is reported to have 18 rigs in operation.

The number of rotary rigs in areas outside the U. S., Canada, and Russia is expected to rise to a possible 685 within the next few years. This steady upward trend reflects the tremendous world-wide search now underway. Areas that hold promise of a marked upturn in drilling activity include Canada, Argentina, Peru, Venezuela, Trinadad, North Africa, the Netherlands East Indies, and, of course, the Middle East.

Oil-transport equipment is under construction at a rapid pace. The past year has seen a phenomenal resurgence of tanker building. At the beginning of this year, there were 440 vessels of 7,453,080 deadweight tons under construction or on order. These ships are equivalent to nearly 420 T2's (a medium-size tanker built during the war).

The United Kingdom has 38.3% of the building program, the U. S. 28.1%, and Sweden 17.8%. Norway is the largest recipient nation with 156 T2 equivalents, or 35.8%. The U. S. and Panama will get 32.6%, while Britain will acquire 16.5% of the new capacity. These vessels will add materially to the present tank capacity, which amounted on Jan. 1, '49 to 1,872 vessels of 15,459,372 tons gross, with 23,815,800-ton deadweight.

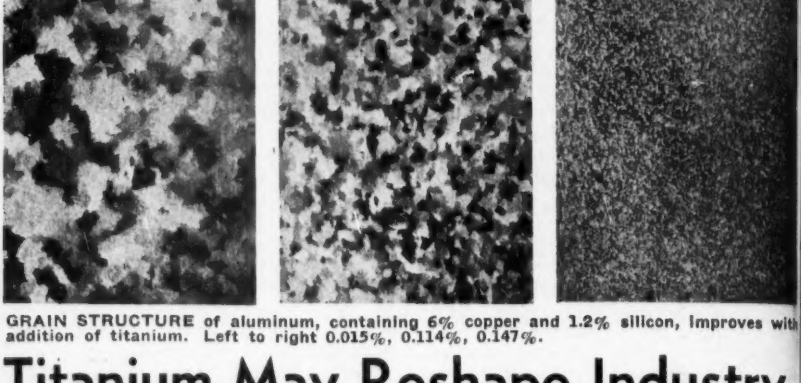
Pipe-line construction projects outside the U. S. total 12,000 miles. Crude-oil lines predominate with 3,100 miles completed and under construction and 4,000 miles more planned. Natural-gas projects comprise about 1,780 miles completed and under construction, plus 2,100 miles planned.

The world capacity to refine crude oil into marketable products is rapidly approaching 10-million bbl. daily. Including refineries under construction or authorized, capacity of more than 650 widely scattered plants exceeds that total.

Large North American Capacity

Excluding Russia and satellites, approximately 69% of world capacity at the first of this year was in North America. This capacity, provided by 431 refineries, amounts to 6.5-million bbl. per day.

Greatest gains in refining capacity since the war for countries outside the U. S. have been made in South America and the Middle East. Postwar expansion in Russia is not definitely known, but refining capacity is estimated at 25 plants with a total rating of 650,000 bbl. crude oil and 250,000 bbl. cracking daily. —Oil & Gas J, D 30, 143



GRAIN STRUCTURE of aluminum, containing 6% copper and 1.2% silicon, improves with addition of titanium. Left to right 0.015%, 0.114%, 0.147%.

Titanium May Reshape Industry

New discoveries as to application and alloying properties of titanium may make this metal as important to industry as are aluminum and steel

TITANIUM TODAY appears capable of shaping industry to the same extent as did aluminum and steel years ago. The metal is not new (see McG-H Digest, D '48, p 26). It was discovered in 1791, but its application and alloying properties only now are being exploited. The rust-resistant, silvery-white metal may find use in such widely divergent products as jet engines and gems, linoleum and cutting tools.

Titanium combines many of the desirable properties of both steel and aluminum. It weighs less but is stronger than stainless steel. It has high heat and corrosion resistance but is easy to work. It has proved to be easy to alloy.

The ninth most abundant element in the world, titanium is the fourth most plentiful metal. It is most commonly found combined with iron oxide, and holds to other metals to form oxides, nitrides, and other compounds. Separation of the ores to the pure metal is a difficult problem.

Iron oxide and titanium oxide are treated with carbon and either fluorine, chlorine, bromine, or iodine. Titanium tetrachloride (if chlorine is used) is formed and is reduced to the pure metal by reduction with sodium, magnesium, calcium, lithium, or barium.

Today, batches of the metal are being produced by this reduction process. It is produced first as a sponge, this being converted to ingot form either by grinding and pressing under heat or by electrical melting. These ingots can be forged, rolled, or cast.

When alloyed, the metal's strength rises rapidly and strength is retained at high temperatures (also improved by alloying). This property will make the metal useful in jet engines, jet-turbine blades, and pistons and cylinder liners for high-speed engines.

In molten form, titanium can worm through ordinary crucibles. Since it contaminates easily, it must be handled under vacuum or in a special atmosphere such as helium. Its high melting temperature demands new refractory materials.

An interesting feature of titanium is its ability to form gems. Finely powdered titanium oxide is blown through an electric oven forming a molten mist. This

mist condenses on a silicate pedestal to form a boule which can be cut and polished into a gem of greater-than-diamond brilliance. Titanium has the highest known index of refraction.

Most abundant source of the metal is ilmenite, found in the black sands of India, Florida, Oregon, Quebec, Norway, China, and Russia. World production of ilmenite has risen from 70,000 tons in 1932 to 600,000 tons in 1948. Titanium content of ilmenite runs 45–60%.—Business Wk, Ja 8, 40

Titanium-Alloy Properties

U. S. Navy symposium on titanium, held recently, revealed wide-spread interest directed toward its physical properties and capabilities.

In the annealed condition (vacuum, ½ hr. at 1382° F.), sheet iodide titanium shows following properties: ultimate strength—32,000 psi.; yield strength—17,500 psi.; elongation in 2 in.—55%; and reduction in area—6%. Corresponding figures for sheet cold-rolled from rod are 107,000 psi., 90,000 psi., 2.5%, and 30%.

The metal is lightweight and corrosion resistant. Young's modulus is intermediate between that of steel and aluminum alloys. Cold working increases strength.

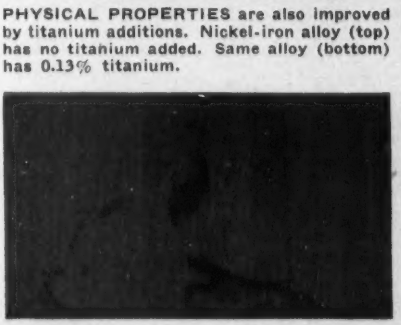
Alloying with nitrogen increases tensile strength almost threefold; with oxygen, twofold. Molybdenum, tungsten, columbium, and tantalum in amounts up to 20% increase tensile and yield strengths. Chromium up to 10% also increases strength. Tensile properties of ternary alloys of chromium, molybdenum, or tungsten with titanium are slightly better than those of binary alloys.—Iron Age, D 30, 41

Melting, Casting Problems

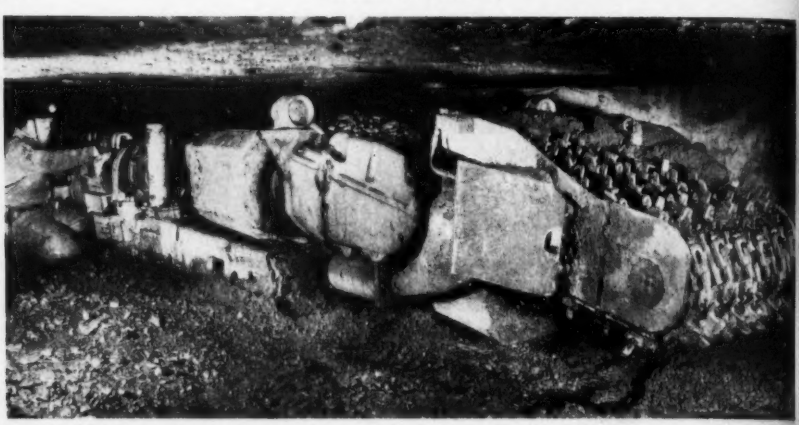
Melting and casting of titanium is complicated primarily by the metal's high melting point and the fact that it reacts with virtually everything it contacts. Powdered metallurgy has been tried but abandoned because of high costs.

Westinghouse Research Laboratories has found that molten titanium reacts exothermically with Al_2O_3 to produce a brittle alloy, resembling neither metal. With BeO, reaction was less vigorous and the alloy less fragile. With thorium oxide, the reaction was slight and test block properties were sufficiently like the original materials to be encouraging. Best results were obtained from dense, high-purity thorium oxide fired at temperatures to 3630°F.

Du Pont reports that induction melting of titanium metal in graphite melting crucible is charged with a 10-lb. sponge. Charge is heated from room temperature to 1110° F. in 1 hr., then power input is stepped up from 6 kw. to 18–20 kw., melting charge in 30 min. Ingots obtained contained 0.4–0.7% carbon and 99% titanium, the remaining 0.3–0.6% being impurities in the original sponge charged into the melting crucible.—Iron Age, Ja 13, 58



PHYSICAL PROPERTIES are also improved by titanium additions. Nickel-iron alloy (top) has no titanium added. Same alloy (bottom) has 0.13% titanium.

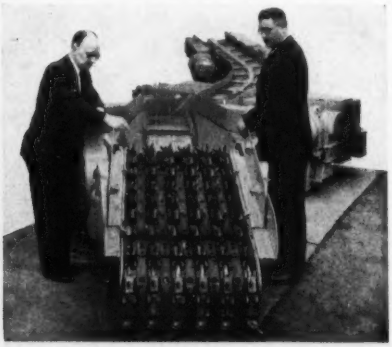


TWO TONS of coal per minute is chewed out by this mechanical miner. It is another step for coal-mine operators toward . . .

Complete Mine Mechanization

Built in two sizes for low and high coal, machine produces up to 2 tons per minute; mines seam 10-17 ft. wide; produces large lumps

CONTINUOUS COAL MINING received another push forward (see McG-H Digest, Ja, p 23) with announcement of Joy Mfg. Co.'s new continuous miner, which in tests mined 2 tons of coal per min. Miner is produced in two models.



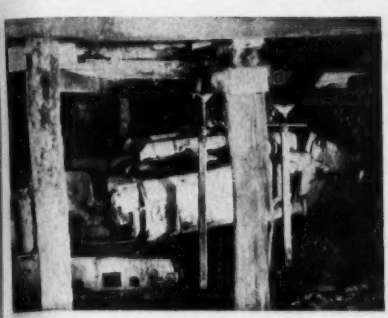
RIPPER BAR and intermediate conveyor can be swung 45° each side of center.

Capable of operating in any conventional mining plan—necking, crosscutting, or pillar recovery—the machine mines a 10- to 17-ft. wide place.

Consisting of a ripping head, intermediate conveyor, and necessary power units, the crawler-mounted unit is 25½ ft. long, 7½ ft. wide. Ripper head and intermediate conveyor can be swung 45° each side of center.

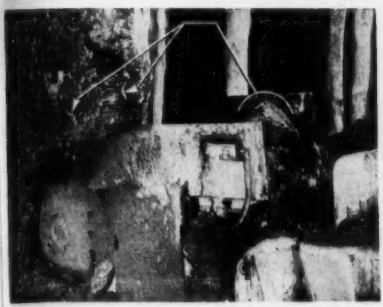
Ripper bar is 30 in. wide and is equipped with 6 chains containing 20 tungsten-carbide-insert replaceable bits. Bits move upward to break coal away from seam, producing a high proportion of large lumps. Each chain of bits is driven separately. Dust is controlled at ripper head by water spray.

Operating costs will be lowered through use of the machine. Greater safety will result. Number of working places open will be reduced, as will necessary roof timbering. Hard bands are cut easily.—Coal Age, Ja, 90; Business Wk, D 25, 34

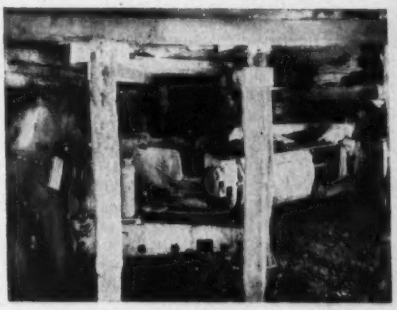


1 MACHINE is drawn through tunnel to face to start room. Operator, 15 ft. back from face, controls cutting by levers.

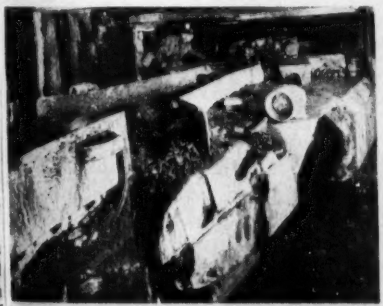
2 RIPPER BAR is sumped about 18 in. into base of seam. Force is from hydraulic cylinders.



3 LUMP OF COAL (shown by arrows) has been ripped loose from face by upward action of ripper, moved rearward by teeth.



4 INTERMEDIATE conveyor picks up coal from ripper teeth and carries it to hopper. When top of seam is reached, head is moved.



5 COAL from hopper is moved to the unloading point by swivel conveyor. Shuttle cars receive coal at end of conveyor.

6 A PITTSBURGH seam face after completion of mining operation. Coarseness of coal equals that of other methods.

Milli-Second Blasting System Keeps Railroad Track Open

In widening Route 22 along the Pennsylvania Railroad right-of-way, contractor used milli-second detonation to keep rock off the track. Although highway ran within 6 ft. of the track, track was blocked only once during the relocation—then because of a landslide.

Use of Atlas Rockmaster electric caps with milli-second delays gave maximum fragmentation and minimum fly. Primers with instantaneous caps were loaded in second row of holes from the back; A delays were used in adjacent holes; B caps were used in the row nearest the tracks. Holes were drilled 8–24 ft. deep by wagon drills. The row nearest track was always at least 10 ft. in. from face. Up to 190 holes were fired in one shot.—Cons Meth, Ja, 66

New Use for Dried Fruits

Process recently developed by Tressler Laboratories consists of comminuting dried fruits to a 40-mesh powder and then adding sugar and a food ingredient that causes a soft jelly to form when mixed with water.

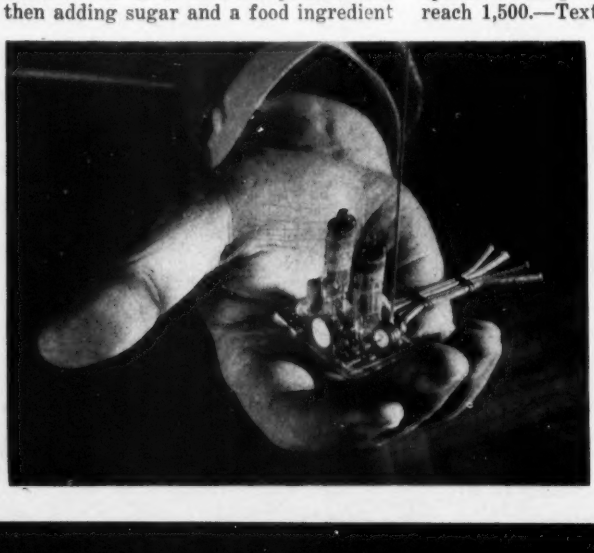
Jelling agent may be gelatin, corn starch, Irish moss, or low methoxyl pectin, depending on particular fruit used. The resulting mix can then be marketed in packages and prepared by adding water and bringing to a boil.

Uses are as a pudding, molded salad, pie filling, ice-cream mix. Any fruit that can be dried can be used in making such mixes.—Food Ind, Ja, 96

Speeds Hosiery Stamping

Hosiery mills that have replaced hand irons with mechanical stampers for impressing transfers on stocking toes have increased output and reduced fatigue of operator. Average production by hand-iron method was 500-700 doz. pairs per 8-hr. shift, during which time the operator lifted an accumulated total of 4½ tons.

Now with automatic or pedal-operated stamping machines average output is raised to 900 doz. pairs. At Trimfit Hosiery Mills, after 3 weeks' training, an operator stamps 1,100 doz. pairs—may reach 1,500.—Textile World, Ja, 127

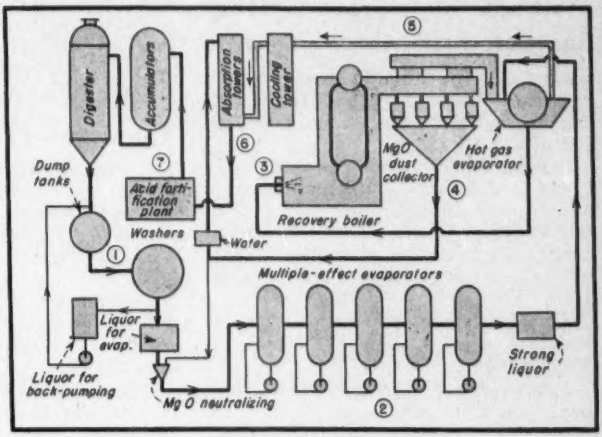


TINY RADIO TRANSMITTER

Base of this tiny radio transmitter is about the size of an airmail stamp. The 0.01-w. radio has a transmission range of over 200 yd. Aerial is 1 ft. long. It has two tubes and crystal controlled circuit; resistors and condensers are little more than smudges of graphite and silver. It was built by the U. S. Army Signal Corps.—Science III, F, 25

NEW BISULPHITE PAPER PROCESS

Flow chart of magnesium-bisulphite process (see McG-H Digest, Ja, p 41) shows digesting of wood chips and dumping (1) to separate waste liquor from pulp. Liquor is concentrated (2) and lignin is burned in recovery boiler (3). Cyclone (4) separates MgO ash from flue gas. Heat in gas is removed (5) in tower. Recovered MgO reacts with SO_2 in tower (6), is fortified (7) and fed to accumulator.—Power, Ja, 101



Modern Bus Shop Services 60 Buses Per Hr., Stores 300

San Antonio Transit Co.'s new maintenance, service, and storage garage is one of the most modern and complete in existence. Built at a cost of $1-million, the 12-acre site can accommodate 300-plus buses. Servicing, of primary importance to fleet operators, is accentuated. At the end of daily runs, buses are serviced in 4 min. each. With four lanes, the service section handles 60 buses per hr.

Air, oil, and water is supplied by overhead reel hoses. Meters record deliveries, attendant merely calls out bus number to clerk over intercom system. Washing, every other day, is by rotary-brush units.

Fire prevention is keynoted. In service area, sprinkler heads are imbedded in bus runways. Should fire break out, it is smothered by the water fog. The entire east side of the building is composed of 29 overhead, roll-type doors for speedy evacuation of shops in case of fire. Fire-resistant materials have been used throughout. Sprinkler systems and fire extinguishers are well placed. Painting and paint-storage areas and oxyacetylene generating plant have been isolated as a safety precaution.

Structure has two stories, the maintenance department occupying the first floor and parts and material storage, offices, cafeteria, and conference rooms the second.—Bus Trans, Ja, 50

Degassing Copper Alloys

Copper and copper-based alloys can be flushed with nitrogen gas to decrease or eliminate porosity and remove suspended oxides. About 8 cu. ft. per ton is the minimum amount recommended for best results.

For high-zinc alloys, in which zinc content is 10% or more, the quantity of nitrogen should be reduced. Otherwise, a considerable zinc loss will occur. About 2 cu. ft. per ton is normally sufficient, as escaping zinc fumes aid in flushing the melt of dissolved gases.

Treatment time varies with metal volume and is usually determined by maximum flow rate that can be tolerated. Best equipment tested to date is a graphite fluxing tube with a porous graphite head.—Foundry, Ja, 88

Methods To Improve Casting Suggested at Metal Congress

Several papers of interest to foundrymen were presented at meetings of the American Society of Metals at the 1948 National Metal Congress.

One on microstructure of cast steels stated that successively better ratios of ductility to strength are obtained as faster cooling rates are used. Maximum ductility is gained by quenching to martensite and tempering at a high temperature. Little loss in ductility and appreciable gain in strength are obtained by moderate rapid cooling (in air) to a Widmanstaetten ferrite.

Another paper reported that thermal sluggishness in cast carbon steel is increased by combined effects of carbon, molybdenum, and vanadium, but not vanadium alone.

Increasing vanadium content reduces pearlite grain size and produces some extremely fine spheroidal carbides. Vanadium also moderately increases tensile strength, yield point, proportional limit, and hardness. It reduces ductility slightly and impact resistance considerably.

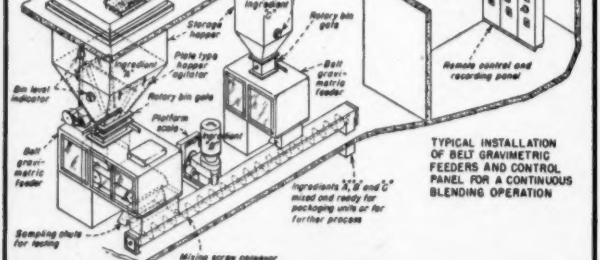
A paper on cause and cure of inverse chill and hard spots in cast iron concluded that hydrogen segregations within the iron are responsible. Use of dry ladles and nitrogen flushing were recommended.—Foundry, D, 122

Tabulates Phone Calls

Bell Telephone Laboratories has developed an automatic message-counting system for use with dial phones. It will duplicate in a fraction of a second the work an operator takes minutes to complete. All necessary information from dialing number to subscriber charge slip is done automatically. In the absence of complete time studies, Bell will not estimate the unit's potential saving.

Information—including number calling, number dialed, time of call, time of answer, time of completion of call—is embossed on rolled paper tape, 3 in. wide and 250 ft. long. A hundred calls may be partially tabulated before first-call information is completed.

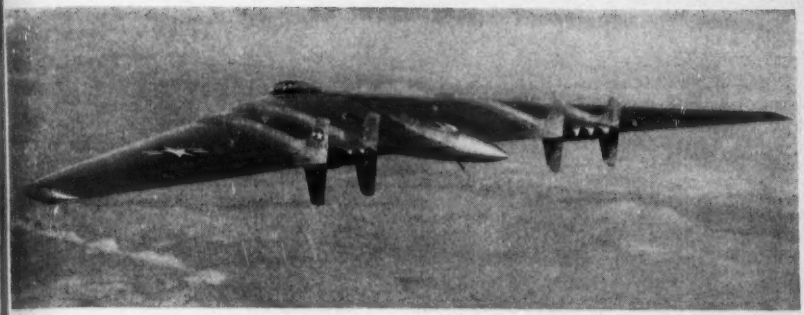
Tape is run through a reading machine that gathers and compiles all information on one call. From tape, length of call is computed. Finally, individual call slips are printed and are sent to the accounting department for posting.—Business Wk, D 11, 21


Automatic loading from remote storage bin
Dust collector
Automatic faulty-feed or failure-to-feed alarm and automatic stop
Bar screened sliding opening
Bin level indicator
Storage hopper
Ingredient
Rotary bin gate
Plate type hopper agitator
Belt gravimetric feeder
Remote control and recording panel
Bin level indicator
Rotary bin gate
Platform scale
Belt gravimetric feeder
Ingredients "A," "B" and "C" mixed and ready for packaging units or for further process
Sampling chute for testing
Mixing screw conveyor

TYPICAL INSTALLATION OF BELT GRAVIMETRIC FEEDERS AND CONTROL PANEL FOR A CONTINUOUS BLENDING OPERATION

BLENDS DRY FOOD

Prepared-mix equipment, developed by Omega Machine Co., proportions and feeds 18 ingredients continuously into screw-conveyor mixer. Vibrating feeders discharge dry food materials onto short endless belts suspended from scales. Scale-arm movement controls vibration amplitude and feeding rate through a control wedge mechanism. Equipment can be used for different types of dry ingredients.—Food Ind, Ja, 19



NORTHROP'S B-49 Flying Wing is the jet version of the B-35. Four fins on trailing edge compensate for absence of propellers used on the B-35.

Flying Wings Feature Low Drag

Parasite drag, caused by fuselage and empennage, eliminated, giving greater speed and range from equal power over conventional planes

BASIC SUPERIORITY of all-wing planes over conventional planes is the elimination of parasite drag caused by fuselage and empennage of the latter. Average drag coefficient of large present-day conventional planes is 0.023. Minimum drag coefficient of several Northrop "flying wings" varies from 0.010-0.0113, the latter being the B-35. Thus all-wing craft run 50% below conventionally-designed planes in drag. In models, Northrop has reached 0.00n drag coefficient.

But parasite, or form, drag is only part of the total drag, the remaining drag being created by wing lift. At high speed, up to 80% of the total drag is parasite drag. Thus the all-wing craft needs only 60% the power required for conventional planes for the same speed. At lower speeds, proportion of the parasite drag is substantially less.

According to Breguet's law, maximum range is reached when parasite drag and induced drag are equal. So if parasite drag is 50% of total drag and all-wing planes have 50% less parasite drag, total drag is only 75% that of conventional planes at cruising speed of the latter. All-wing planes then can cruise at only 75% of the power of conventional planes at the same speed. Range can thus be increased.

Elimination of tail surfaces and fuselage results in saving of their weight, cost, and fabrication time. In a conventional plane the size of the B-35, fuselage and tail surfaces weigh 12-16,000 lb. This net saving can be applied to useful load in all-wing craft. But the absence of tail surfaces creates stability and control problems.

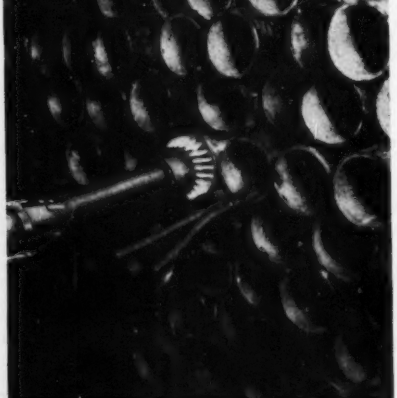
For trimming control, a segment of the wing trailing edge is hinged to serve as an elevator. This changes the camber of attached airfoil and affects the wing's lift, drag, and pitch. When the surface is raised, wing camber and lift are reduced, reducing lift coefficient 20-40% and raising takeoff, landing, and stalling speeds above those of conventional craft. This requires added wing area.

In the B-35, wing loading is about 40 lb. per sq. ft. compared with 75 lb. per sq. ft. for the B-29. This added area gives added produced drag.

Wing sweepback is used to reduce lift

coefficient. By using sweptback wing, aerodynamic chord can be moved to the rear, wing-tip areas are aft of the center of gravity so control surfaces at these points possess an effective "tail length," and high-lift trailing-edge flaps along center section can be used.

Major disadvantage of sweepback is creation of spanwise flow, which is the main stability problem of all-wing planes. Air tends to flow from regions of higher pressure (inboard) to lower-pressure area (torward tip). This drift increases pressure over upper surface and reduces tip lift, the tip tending to stall. Tip stalling can be overcome by wing twist, slot near leading edge, slats at leading edge, or air "dams" extending forward to a point near the leading edge, as used on the B-49.—Aviation Wk, D 20, 21



FLAME REMOVES MILL SCALE

Mill scale in boiler tubes causes galvanic action, so all scale should be removed before installation. Quick way is to apply intense heat that expands and cracks scale. Water-cooled torch, made by Linde Air Products Co., has No. 67 drill-size flame orifices at 45° to head. It burns oxygen at 25-30 psi. and propane at 5.75 psi. Compressed air at 5-7 psi. is fed to flame through small holes back of head.—Power, Ja, 103

Prestressed Warehouse Floor Uncracked After 18-Mo. Use

Jointless prestressed concrete floor, subjected to pressures of 1,000 psi. in the warehouse of John A. Roebling's Sons Co., shows no cracking after 18 months of use. The 96x144-ft. area is used to store reels of wire rope. Although the prestressed floor costs more than conventional flooring with joints, the greater durability and low maintenance offsets the added initial cost.

Subgrade consisted of compacted foundry sand over yellow clay. The 3-in. prestressed layer was placed on a 9-in. unreinforced concrete base. A 1/32-in. paraffin layer insulated the two layers. After prestressed wires were laid, slab was cast in three sections, one section a day. Curing was in open air. Longitudinal stressing was with 9/16-in., 7-wire galvanized strands with 45,000-lb. breaking strength. Perpendicular stressing was by two layers of No. 6 bridge wire. →Eng News-Rec, Ja 6, 68

Iron Transverse Test Bars

U. S. Naval Research Laboratory molds test bars in a horizontal position so sand can be rammed uniformly hard against the entire surface. Chromium-plated steel patterns have been found satisfactory.

Tests have shown that horizontal casting yielded bars with better physical properties than did vertical casting. In the latter method, the metal near the bottom is strongest. In horizontal molding, the pattern is drawn out at the end of the flask.

Accuracy of measurement in transverse testing was improved by anchoring a dial indicator to the ram of the testing machine. The dial pin was then placed in contact with a rigid reference bar placed parallel to the test bar. Deflection can be read directly on the dial at appropriate loads.—Foundry, Ja, 82

Surface-Hardened Stainless Steels Resist Wearing

Ferritic or austenitic stainless steels can be made highly wear resistant by a nitriding process known as Malcomizing. Surface hardness can be increased up to 1,000 Brinell.

First, dissociated ammonia gas is passed over the parts, held in a sealed container in a furnace, to reduce any surface oxides. Furnace is held at about 850° F. Ionized ammonia gas is then passed into container to add nitrogen. The absorbed nitrogen combines with chromium to form chromium nitrides.

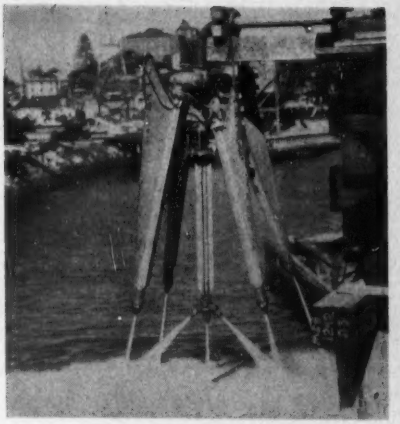
The process produces practically no distortion. Case depths with Types 502, 410, and 416 run to 0.020 in., while maximum case depth with Types 302, 304, 316, and 347 is limited to 0.010 in. Malcomized steels, besides being wear-resistant, also have good fatigue and erosion resistance.—Prod Eng, Ja, 84

Time-Study Method for Mines

Pennsylvania State College has perfected a time-study procedure to locate bottlenecks in loading and handling operations which account for 33% of all coal-mining production costs. Method combines a time study of loading and gathering cycles, a method study of the mine layout, and a production study by which mining operation can be rated as to efficiency.

One observer takes standard data at loader, using specialized symbols. Second observer takes similar data at discharge point. Before study can be made, observers must have an accurate map of the mine, number of men and machines working, and production achieved previously.

Studies have shown that maneuvering is 4.85% of shift time; 12.25% of shift time is spent waiting for cars; 8.59% of shift time is spent changing places.—Eng & Min J, Ja, 68



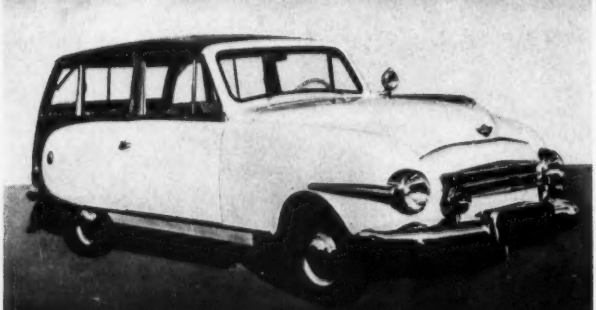
HYDRAULIC AUGER

To sink foundation caissons for a 25-ton harbor crane, an Australian contractor designed this 7-jet, 150-psi. hydraulic auger. Clay, loosened by auger, was raised by pneumatic lift. Auger worked to depths of 50 ft. The 3-jet center shaft has 1-in. nozzles, the four extendable shafts having ⅝-in. nozzles. The rig is rotated in a horizontal plane from the surface.—Cons Meth, Ja, 76

Two Oil Intakes Protect Against Engine Damage

If dual oil pumps were placed in engine lubrication systems, one would take care of normal needs, the other indicate predetermined high or low oil level, even filter the oil if necessary. The dual pumps might eliminate much damage to bearings, pistons, rings, cylinder walls.

The extra pump could be driven by the regular pump shaft or be mounted on the outside of the engine and driven separately. If externally mounted, a tubular dip-stick could be used by drilling a hole at the proper level and connecting it to pump by tubing. If the extra pump were added, it might be advisable to disconnect the oil filter from the regular pump and hook it to low-level pump.—Bus Trans, Ja, 72



NEW PLAYBOY STATION WAGON

Playboy Motor Car Corp. soon expects to begin assembly of station wagon to be priced about $1,500. Specifications: 96-in. wheelbase, 2,350-lb. weight, 4-cyl. Hercules engine, 4-passenger.—Am Mach, Ja 13, 130

Vacuum Phototubes Control High-Temperature Furnaces

Production problems and measurements of material properties often require high temperatures held constant to within 1 or 2%. For a temperature range of 1800–5000° F., vacuum phototubes offer the most promise as sensing elements.

Phototubes and their associated resistors are quite stable, are rapid in response, and may be used with or without an optical filter. One objection to their use is the necessity for clean optical system. A phototube must always view a surface with the same optical characteristics.

The dc. amplifier for phototube may be either stable zero or constant signal amplification type. In the first, a reference voltage is made approximately equal to phototube voltage output and the difference voltage is amplified. This circuit is as accurate as the zero of the amplifier is stable.

In the second type, an iris diaphragm placed in the optical path is adjusted to admit about the same amount of light to the tube at each control temperature. Amplifier output voltage then is essentially the same for every temperature to be controlled.

With either circuit, required amplification is of the same order; the output must operate the same on-off or phase-shift control to vary the heating current. —Electronics, F, 80

Can High-Altitude Dynamotor

Operational efficiency of a dynamotor at high altitudes is not impaired now that Bendix Aviation Corp. is hermetically sealing them in tin cans—common vegetable cans. There is no heat problem created by sealing up the unit. Special yoke is used to save weight and space: sponge rubber bumpers eliminate end play. Terminals on end of can require special chucks on standard canning machinery. For repairs, can is opened with a standard can opener. Cans should withstand altitudes up to 200,000 ft.—Aviation Wk, Ja 17, 38

Paint Resists 1000° F.

Council for Scientific and Industrial Research, Australia, has developed a paint that is highly heat-resistant. Basis is butyl titanate, produced from rutile and ilmenite. Tested on inside of a power-plant flue stack, the paint checked corrosion which normally removed 1 oz. of steel per sq. ft. every 6 weeks. After 32 weeks, paint was little affected.—Chem Eng, Ja, 210

Earth Not Always Good Heat Source for Heat Pumps

The earth by itself in many areas does not look too promising from a practical standpoint as a heat source for heat pumps. This conclusion was reached from tests conducted on three types of embedded surfaces to determine heat-transfer rate with the earth used as a heat sink and heat source.

Types were: (1) a 50-ft. and two 40-ft. tapered monotube piles buried vertically and having surface area of 382.2 sq. ft.; (2) 30-ft. by 3-ft. dia. tube bundle buried horizontally with 106-sq. ft. area; and (3) five 20-ft. by 2-in. wrought-iron pipes with 1-in. inside pipes buried vertically and having a 62.5-sq. ft. area.

The last type offered the best practical application. About 480 ft. of each pipe would be needed for a heat-pump output of 45,000 Btu. per hr. under the following conditions:

1. Minimum ground temperature of 47° F.
2. Normal on-off operating cycle.
3. A 3.5 coefficient of performance.
4. A 20° F. refrigerant temperature in embedded surface.—Elec World, Ja 1, 34

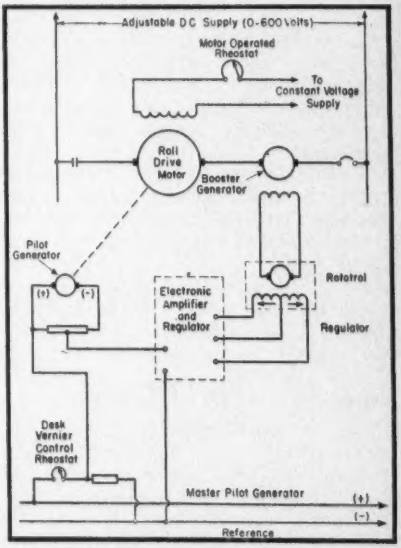
Inert-Gas Hard Facing

Among papers presented at the American Welding Society's 1948 annual meeting was one on hard facing and surfacing with gas-shielded arc. In experiments carried on by the Linde Air Products Co., it was found that mild steel could be successfully hard-faced with various types of cobalt-chromium-tungsten alloys.

An iron-base alloy also produced smooth deposits. A work-hardening alloy similar to austenitic manganese steel, containing both chromium and manganese, flowed smoothly with little porosity, although a wider weave was necessary than with alloys of cobalt-chromium-tungsten group.

Argon was employed as the shielding gas. A backhand technique with ac. produced maximum hardness. But for most applications, forehand welding with dc. straight polarity was preferred.

Other successful experiments included hard-facing copper with cobalt-chromium-tungsten alloys; coating copper with silicon bronze and aluminum bronze; coating mild steel with aluminum bronze, copper, or austenitic stainless steel; and surfacing stainless steel with copper.—Weld Eng, D, 33



REGULATES ROD-MILL SPEED

Speed of new rod mill at Laclede Steel Co.'s Alton plant is controlled by Westinghouse electronic Rototrol system. Each driving motor is equipped with pilot generator. Any speed change is transmitted to electronic amplifier and passed along to Rototrol rotating excited booster which instantly corrects speed by corrective action in motor-armature circuit. Sensitivity for linear response is ±0.2 v. with available amplification of 450-500.—Steel, D 6, 134

Old Mine Reopened After Sand-Slime Stope Filling

Idaho Maryland Mines Corp. reopened its New Brunswick properties, closed during the war and badly caved during the non-worked years, by sand-slime stope filling. Fill material—600 tons per day of 1% plus-28-mesh and 30-35% minus-200-mesh—was mill tailing running 72% solids. Per day, 242 dry tons are deposited.

For such filling, tailings with 1-5% plus-35-mesh should flow not less than 8 fps.; with 1-2% plus-65-mesh tailing flow should be cut to 6 fps. A standard 2-in. pipe has handled 70,000 dry tons of tailing. If butt-connected joints are used, total load can be raised to 100,000 dry tons at least. A 3-in. pipe, so joined, might carry 150,000 dry tons before wearing through. Victaulic couplings are recommended.

Tailing pipeline was brought into stope within 8 ft. of back, a catwalk being built to permit access to valve for flow control. Fill was started at far end of the stope, tailings sloping toward timbered wall. Continuous draining off of surface water reduces break-out.—Eng & Min J, Ja, 54

Improvements in Cotton

Chemical modifications in cotton being tried at the Southern Regional Research Laboratories were discussed at the recent Textile Research Institute meeting. Interesting new developments included:

Cotton ducks treated with a resin-pigment combination—urea formaldehyde-lead chromate—showed a 5% strength loss after a year of exposure against a 50% loss for untreated duck. . . . Drafting studies on several varieties of cotton of different staple length have been conducted on high-draft, or dual-zone, type of frame. Substantial improvement was shown in uniformity with long-fiber cottons and with short, coarse-fiber varieties by a better proportion of drafts between the two zones.

A new experimental slasher dries yarn by incandescent gas burners in an infrared, hot-air oven. Slasher offers better heating control.—Textile World, Ja, 139

Applies Titanium Enamel To Titanium Steel

For successful enamel application, titanium steel must be freed of all grease, oil, and shop dirt by proper cleaning. Rust and weld scale are removed by pickling in H_2SO_4 before the steel enters the nickel bath.

A minimum of 0.080–0.120 g. of nickel per sq. ft. of area must be deposited on the steel to insure a good enamel-steel bond. The steel than passes through an acidic bath (H_2SO_4) for nickel-sulphate and iron-hydrate removal, and neutralized in two mild alkaline baths (NaOH-NaCN and Na_2O).

Titanium-enamel formula used at Westinghouse Electric Corp. is: 100 parts frit, 2.2% clay, 0.8% tint oxide ½ setit A, ½ sodium aluminate, ½ bentonite, ½ potassium carbonate, ½ sodium nitrite, ⅛ urea, ⅛ gum tragacanth, 32% water, and 0.4–0.6 fineness.

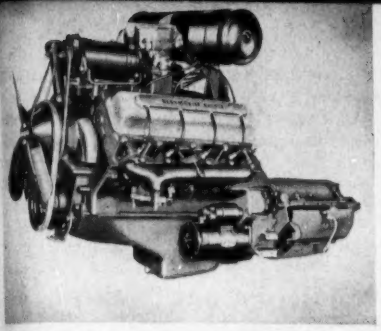
Westinghouse prepares its own enamel under strict millroom standards. Each batch is given four tests before it is removed from the mill, including spraying and firing a test plate for color checking. —Steel, Ja 17, 64

Adds Years to Pump Life

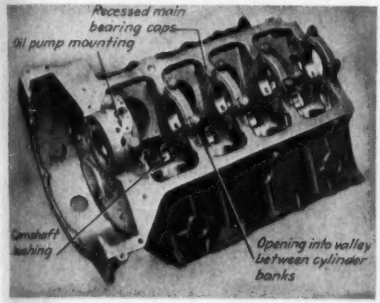
Proper starting of a centrifugal pump when it first goes into service calls for three important steps. First, bearing housings should be flushed out with kerosene, and bearings filled with new lubricant. Second, with coupling bolts removed, driver's direction of rotation should be tested. Third, all parts should be thoroughly inspected, and pump rotor checked to determine whether it can be turned by hand.—Oper Eng, Ja, 38

Design Features of Olds Engine

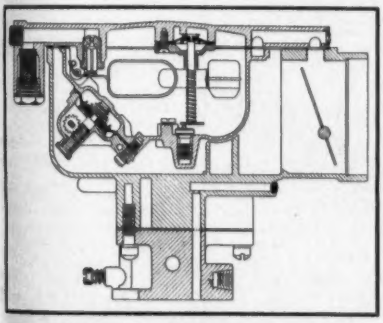
First commercial version of Kettering high-compression engine is 1949 V-8 Oldsmobile power plant. Compression ratio—7.25:1; bore—3¾ in.; stroke—3 7/16 in.; displacement—303.73 cu. in.; power—135 hp.—Prod Eng, Ja, 88



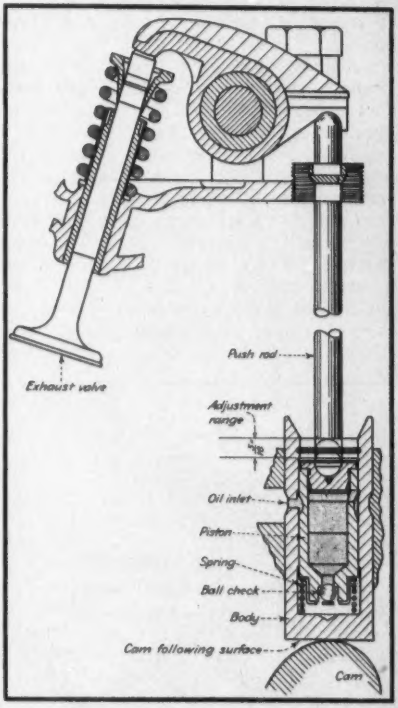
V-8 ENGINE DESIGN gives stiffer crankcase, shorter engine, and stiffer crankshaft. Other features—overhead valves, hydraulic valve lifters, dual carburetor.



CRANKCASE view from below shows the valley openings and how main-bearing bulkheads tie the two V banks together.



DUAL CARBURETOR has operating elements mounted on top late, thereby simplifying servicing problems.



OIL PRESSURE in valve-lifter cylinder plus spring develop force to take up all slack in linkage but not enough to lift valve. When cam nose begins lifting, ball check closes, and body and piston ride cam as integral unit. Design avoids tappet-cam impact.

Switched Capacitors Will Relieve Generator Loading

Pennsylvania Power & Light Co. is installing a new 15,000-kw. generator to meet power demand and 90,000-kvar. of switched capacitors to supply the reactive component.

Application of switched capacitors will be made because the voltage-control method is unique in that few feeder voltage regulators are used. Instead, the voltage level of the entire supply system is raised or lowered to compensate for increases or decreases in voltage drop caused by load.

This control is made at all power generating stations and at large load centers throughout the system where synchronous condensers or switched capacitors are available. In addition, switched capacitors, located at smaller load centers and along distribution feeders, uphold voltage at points where otherwise it would sag. Thus the whole system, a 66-kv. network, is treated as a sort of bus.

Analysis of the system has shown:

1. That reactive generation at the load is necessary to avoid adding more lines and transformer capacity.

2. That the reactive supply must be variable with the load.

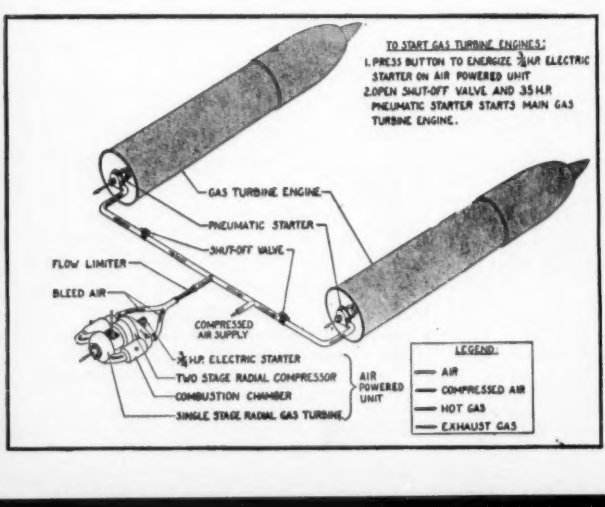
3. That judicious application of this variable reactive capacity, supplementing the variation of voltage level, results in adequate voltages throughout the distribution system.—Elec World, D 4, 85

Protects Peanut Quality

Peanuts stored at low temperature have superior flavor and color. Rancidity is retarded, and insect infestation prevented. Care must be taken to prevent absorption of flavors and odors.

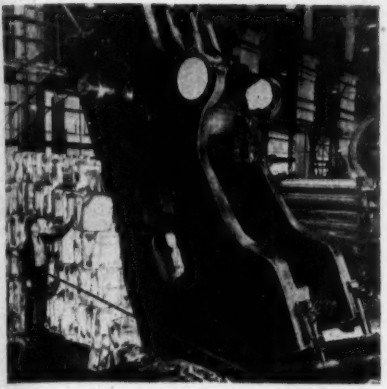
Odors of certain fruits and vegetables —apples, citrus fruits, dried apricots, potatoes, and onions—are especially troublesome. If peanuts must be stored with other foods, those products should have compatible odors. They include rice, grains, dried eggs, dried milk, candy, and anything sealed in glass jars, cans, or odorless paper bags.

Activated carbon, placed in bags of peanuts, is helpful in preventing flavor absorption and removing absorbed odors. —Food Ind, Ja, 66



STARTER FOR TURBINE ENGINES

Requiring no external power source, this self-contained self-starter for turbojet and turboprop airplane engine saves 20% in weight and gives 75% increase in starting power output over conventional starters. Consisting of a compressed-air power source and a small air-operated starter, it can be used in 2-, 4-, 6-, and 8-jet aircraft. It is energized by a 24-v., 100-amp., ¾-hp. electric starter. It is an AiResearch Mfg. Co. product.—Aviation Wk, D 27, 27



ICE—MATERIALS HANDLER

This 275,000-lb., 20-ft. high press bed had to be laid flat at Chevrolet Muncie plant before it could be shipped to Detroit. Workmen placed 350 cakes of ice behind press, let them freeze solid, then tilted press against ice. As ice melted, press sank slowly to horizontal position.—Am Mach, Ja 27, 278

Infrared-Dryer Fires

Principal causes of fires on infrared dryers are (1) ignition of paint residues, flammable vapors, cloth, or paper by hot parts of broken lamps and (2) ignition of residue or combustible dryer parts from lamp heat.

Preventive suggestions are to protect lamps from spray, drip, splash, or condensation and also from mechanical breakage by work on conveyors. Broken lamp parts should be prevented from falling into dip tanks or on combustible work. Ventilation should be sufficient to avoid formation of explosive atmospheres in contact with lamps.

Interlocks should be provided to cut off lamp current when conveyor stops, ventilation fails, or breakage occurs in processes such as continuous paper drying. Dryers should be built of noncombustible materials. In case of fire, only CO_2 or dry-chemical equipment should be used.—Elec World, D 18, 96

Plastic Replicas Determine Surface-Finish Measurement

Determining surface finish of large parts is simplified by use of plastic replicas taken on a strip or film of cellulose acetate. The impression is measured directly by a stylus recording instrument.

At the British National Physics Laboratory, the cellulose acetate is softened by a solvent prepared by dissolving 5–10 gm. of cellulose acetate in 100 ml. of acetone. A few drops of this solvent is brushed on the machined surface.

The acetate sheet is pressed on firmly until the excess acetone, squeezed out at the sides of the sheet, is observed to set. Pressure is released, and the replica is left in position for 5–10 min., then peeled, and allowed to harden in air for 30 min. before measuring.

Accuracy tests on the method showed a slight shrinkage occurring in the surface of plastic replicas. This shrinkage was found to be fairly constant over a large number of tests and, in general, does not exceed 10% of total depth for machined surfaces.—Mach, D 18, 1115

Combustion Fume Disposal

Getting rid of process fumes by combustion is possible in a new furnace developed by Brooklyn Union Gas Co. System consists of at least four pieces of equipment. First is a set of kettle covers designed to collect fumes. Second is main fume duct with branch lines to individual kettles. Third is the furnace, and fourth a chimney, exhaust blower, or ejector system.

The furnace has a gas-fired fume-ignition zone and a fume-combustion zone. The latter zone has additional radiating surfaces to insure complete combustion of slow-burning or wet fumes. Each proposed installation must be engineered to fit specific needs. Uses are in paint and varnish industry, tinplate lithographing.—Chem Eng, Ja, 110

Technical Shorts

Textile Workers on Incentive—Mount Hope Finishing Co. has placed productive and non-productive employees on a monthly incentive system. Incentive pay is determined on the amount by which allowable productive-labor payroll exceeds actual productive payroll. Productive payroll was determined to be 28.9% of billings, the average of previous 20 yr. of operation. Three-quarters of the saving is distributed, 25% being placed in a sinking fund.—Textile World, Ja, 98

Gas Plating—Metal plating through use of a gaseous medium employs heat as sole means of deposition. It involves thermal decomposition of metal carbonyls in CO_2 atmosphere. Coating is quickly obtained at 400°F. Process is applicable to any metal that can withstand that temperature.—Foundry, Ja, 128

Novel Concrete Finish—Novel exterior facing of the new Tellepsen Construction Co. all-concrete building was obtained by painting wood forms with a thick coating of molasses before concrete was poured. When forms were removed, rough-finished surface remained.—Eng News-Rec, D 30, 19

Prevents Tipple Accidents—Lightweight metal guards are placed over pushbutton motor switches in Lorain Coal & Dock Co. tipple during repair to prevent accidental starting of motors. Buttons cannot be pushed until cover is removed. Guards are chained to panel above the 18-switch panel.—Coal Age, Ja, 102

Jig Bore Cuts Cost—Thousands of dollars of production costs on boring forgings and castings at Consolidated Aircraft Corp. have been saved by a $300 jig boring tool. The portable tool performs to ±0.00025-in. tolerance. It is powered by a conventional electric or pneumatic hand drill.—Aviation Wk, D 27, 25

Handles Coiled Rod—Lamson & Sessions Co. is using an ingenious "hairpin" type hook on a bridge crane for handling coiled rod into and out of storage. Loads up to 3,500 lb. can be picked up and maneuvered with utmost ease.—Steel, D 27, 54

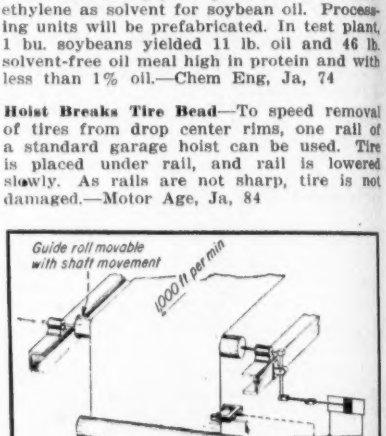
Half as Bright as Sun—Developed experimentally by Westinghouse Electric Corp., a 10,000-w., short-arc, high-pressure, cadmium-mercury vapor lamp has about half the brightness of the sun. Arc is ¾ in. long; shortness gives high degree of optical control. Lamp is suitable for color movies.—Electronics, Ja, 175

For Bus Seat Backs—Stainless Rigidized Metal for bus seat backs withstands abuse better than standard materials. Giving greater strength and rigidity, the metal permits use of a lighter gage without loss of quality. Patterned, texturized surface diffuses light, conceals ordinary scuffing.—Bus Trans, Ja, 165

Rolling Chairs—Assembly bench chairs in the pinion-cutting department of Hamilton Watch Co. are set on 4-wheeled rolling platform to enable operators to tend four machines. Platform is pushed easily by foot leverage against foot-rest rail.—Factory, Ja, 143

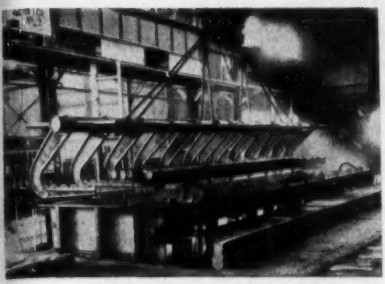
Packaged Solvent Extraction—Developed at Iowa State College, new process uses trichlorethylene as solvent for soybean oil. Processing units will be prefabricated. In test plant, 1 bu. soybeans yielded 11 lb. oil and 46 lb. solvent-free oil meal high in protein and with less than 1% oil.—Chem Eng, Ja, 74

Hoist Breaks Tire Bead—To speed removal of tires from drop center rims, one rail of a standard garage hoist can be used. Tire is placed under rail, and rail is lowered slowly. As rails are not sharp, tire is not damaged.—Motor Age, Ja, 84



AIR GUIDES CLOTH

Edge position of cloth on processing rollers is controlled to limits of ±0.05 in. by air stream in this positioner developed by Askania Regulator Co. One nozzle passes air past edge of cloth to the other nozzle, connected to the diaphragm of the position regulator. Movement of the fabric between nozzles varies air to diaphragm which changes position of fabric on the roller.—Textile World, Ja, 144



HANDLES HOT STEEL BARS

Spang-Chalfont Div., National Supply Co., has developed, for its own use, a lifting rig to handle bars of 30-50 ft. long and 4-8 in. in dia. Requirement was to keep bars straight for oil quenching after heating to austenitizing temperature. Main members of rig were made of pipe, while hooks were welded of web plates reinforced by pipe along edges. Assembly can support five bars at once.—Weld Eng, N, 62

Cherry Picker Hoists Mine Cars—Only 8 sec. are required to raise mine car and a similar time to replace it on the track with a cherry picker designed by Hecla Mining Co. Monorail-support on A-frame trolley and four pneumatic cylinders comprise unit. Two cylinders raise car, one moves it laterally, one lowers it. Cars are hoisted by 3-point suspension.—Eng & Min J, Ja, 94

Sanitary Humidity—Experiments at University of Chicago showed that humidity of 50% is unhealthy for virus, type 1 pneumonia germs, staphylococci, and streptococci. In tests on rats, influenza virus killed all at 10 and 80% humidity and only 22% at 50% humidity.—Food Ind, Ja, 52

"Spitted" Cars Rustproofed—Standard Motor Co., Ltd., England, rustproofs Vanguard 900-lb. automobile bodies by mounting them on "spits" and slowly rotating them as they pass through sprays and dip tanks. Rotating bodies insures every corner and crevice is reached.—Mach, Ja 1, 1149

To Overcome Power Shortage—Italy has ordered two 300-hp. mud pump motors and one 250-hp. draw-works motor from Westinghouse. Motors will be used on drilling rigs set up to tap water sands near hot lava beds. High-pressure steam emitted from beds will turn large turbogenerators. Pilot operations will be conducted at Larderello.—Iron Age, Ja 13, 41

Detects Nuclear Radiation — Scintillation counter is one of the most important advances in radiation-detection devices since invention of the Geiger counter. Principle of operation is absorption of nuclear particle by phosphor crystal, which emits light flash that falls on multiplier tube. Current impulse from tube is amplified and fed through pulse height discriminator to rate meter.—Nucleonics, Ja, 16

Clean Air Cuts Spoilage—A Southern textile mill produced 1-million yd. of rayon-filled crepe, satin, and voile per month with spoilage of 168,000 yd. Installation of electrostatic air cleaners cut spoilage to 50,600 yd. per month by avoiding dirt smears on fabrics. —Elec World, Ja 15, 119

Saves Welder Running Time—Automatic shut-off of welding machines after 2 min. of idle running reduces running time about 55%. Results: reduction in power load, demand, reactive kva., and energy consumption; less machine maintenance; no interference with welding technique.—Weld Eng, Ja, 52

Broken Shot Lowers Strength—In shot-peening test, sets of a ten ½-in. plates were treated in various ways, then given fatigue-bend tests. Results: non-peened plates—50,000 cycles; plates peened to 0.010 arc height with coverage of over 100% with broken shot—130,000 cycles; plates peened similarly with whole shot—270,000 cycles.—Am Mach, Ja 13, 100

Elevators Truly Automatic—New elevator system can be set to six different traffic patterns. Called "autotronic elevatoring", system automatically controls car dispatching and spacing. Passenger waiting time is measured by condensers that charge to predetermined voltage.—Prod Eng, Ja, 7

Takes to Rails—First gas-turbine electric locomotive built in the U. S. began track tests late last year at General Electric Erie plant and will be put in operation this spring by Union Pacific RR. It has continuous tractive effort of 68,400 lb. at 20.4 mph., is geared for 79 mph., and carries enough fuel for 12 hr. Turbine drives generator supplying eight traction motors.—Power, Ja, 134

READER SERVICE

As a special service to our subscribers, McGraw-Hill Digest will furnish, without any charge, additional information about any new product or technical development described. Address your letter to: The Editor, the McGraw-Hill Digest, 330 West 42nd St., New York 18, N. Y., U. S. A. ***—THE EDITORS***

Steelmaking Progress Notable

New processes in steelmaking are bringing production practice to the threshold of a new era. These range from blast furnace to rolling mill

BLAST FURNACE capable of producing 2,000-lb. of pig iron every 24 hr. is perhaps the most important possible new development in the iron and steel industry. Such a blast furnace is not yet a reality, but few doubt its imminence—particularly, as a Pittsburgh stack with a 28½-ft. hearth has cast a new world's record of 1,910 tons in a 24-hr. period.

Many experts believe that within not too many years a 30-ft. hearth will be built with a 2,000-lb. capacity. Even a greater capacity might be possible. Such a furnace would be burdened with the best beneficiated iron ore and a good grade of sinter, and charged with a fast-burning coke.

Consideration now is being given to application of carbon for stack lining, based on improvement afforded by this refractory in hearths. Present practice indicates use of a carbon-lined hearth does not affect heat economy to any serious extent.

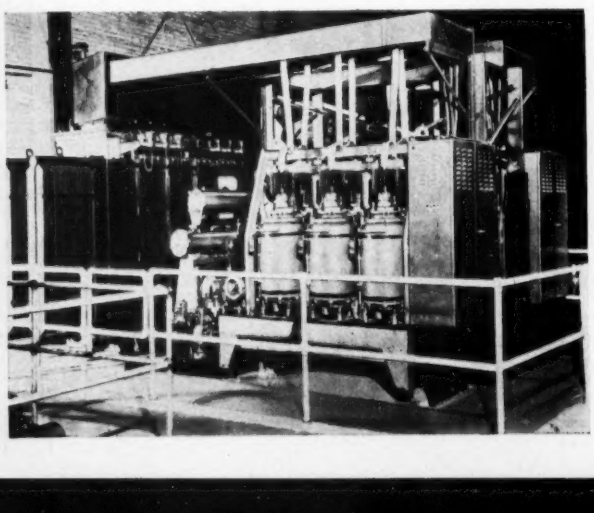
On blowings after banking, absence of a sizeable salamander contributes to saving of fuel required to bring the furnace back to heat. A lining of all carbon or all fireclay is preferable to partial linings.

High top pressure in blast-furnace blowing was extended to five additional furnaces last year by Republic Steel Corp. The company thereby gained the equivalent of one furnace output.

Blast-furnace men are interested in a new oscillating ignition device now being used for sintering lead concentrates at a 40% fuel saving. Also of interest, and successful in opening tapholes, is the jet caster—a projectile-shaped unit 1 ft. long, 2 in. in dia., and containing about 2 oz. of explosive.

A recent advance made in stockhouse scale cars at blast furnaces is a scale design in which main knife edges and bearings are enclosed in a steel housing. Trend is toward use of double-compartment cars.

Oxygen use in blast furnaces and open-hearths is gaining. Weirton Steel Co.



MERCURY-ARC rectifier supplying 1,000 kw. of dc. power to rail mill of Carnegie-Illinois' Gary Steel Works has high operating efficiency and low maintenance record (see facing page)

reports its capacity increased by 20% by operation of its 400-ton oxygen plant. Weirton also has found that in bessemer operation with oxygen additional scrap up to 20% above normal may be charged. Oxygen also is finding wider use in electric-furnace practice.

Basic brick continues to be of interest to openhearth operators. One plant with furnaces equipped with basic ends and silica main roofs notes less repair time and 5-7% production gain. Development of a graphite base brick is making possible easier removal of slag deposits.

Continuous casting (see McG-H Digest, Nov. '48, p 16) is being watched closely. Another important advance is a new rolling mill under experimentation. It is capable of producing 3-10 times that obtained from an almost duplicate all-pull Steckel mill. Over 35% reduction per pass has been made on soft stainless, silicon and carbon steels and over 50% on low-carbon steel.

Other developments last year were a new flying shear drive, a saw for cutting skelp in transit at 1,000 fpm., and a rotary flash trimmer.—Steel, Ja 3, 140

Steel-Mill Mercury-Arc Rectifiers

Mercury-arc rectifiers for supplying power to auxiliary drives and electronic frequency changers are undergoing rapid growth in modern steel-mill use

GOOD SERVICE RECORDS and operating advantages have meant increasing use of mercury-arc rectifiers to supply dc. power in steel mills. They have practically superseded rotating-type ac. to dc. converters for dc. voltages above 200 volts and in capacities above 200 kw.

Carnegie-Illinois Steel Corp. has installed 20 units totalling 19,700 kw. of 250-volt dc. mercury-arc rectifiers. At present, two 1,000-kw. and five 500-kw. units are on order.

In planning industrial installations, several characteristics of rectifiers should be kept in mind. Rectifiers will not in themselves handle regenerative power. If they supply dc. power to cranes or any over-hauling load, a dynamic brakin panel must be added.

Rectifiers have a higher efficiency than rotating units. For 300- to 500-kw. rectifiers, better efficiency nets about 15 kw. per hr. of operation. Operating records have been good. Units will function as unattended transformer substations with only routine inspections and repairs. Single-anode rectifiers are regarded as having better maintenance records than does the multi-anode type.

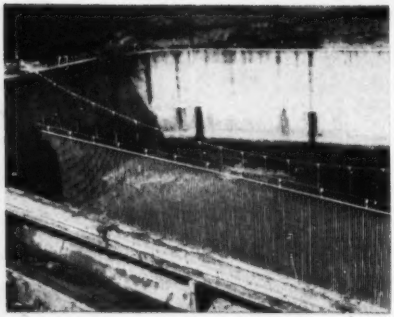
Carnegie-Illinois also has pioneered in application of electronic frequency changers. Its two installations are a 20,000-kw. installation and a 6,667-kw. unit now being replaced by two 8,000-kw. frequency changers.

Each installation uses two sets of mercury-arc rectifiers. The first receives ac. at 25 cycles and coverts it to dc., which is fed into the dc. side of the second set for conversion to 60-cycle ac.

Electronic frequency changers are used for this service because (1) the 25- and 60-cycle systems do not have a fixed ratio, and (2) it was desired to regulate power independently of voltages or frequency variations in either system.

They have a higher efficiency at all loads than does rotating equipment. They also provide ease of power-flow control, ease of starting with no shock to system, and low maintenance costs. Over-all efficiencies from 66,000 volts, 60 cycles to 44,000 volts, 25 cycles have averaged 94%.

A disadvantage of this equipment is that it is not adaptable for a stub-end feed. There must be a supply of reactive power on both systems connected by the frequency changer. As both installatons connect with large generating systems, this was not a problem.—Elec World, Ja 1, 48



DIVERTS FISH FROM HYDRO PLANT

Electronic fish screen now guides fish downstream past headworks of hydro-electric plant on Hood River, Oregon. It consists of lattice of 10-ft. electrodes strung across mouth of intake canal. Electric impulses at 700 v., sent out six per sec., tickle the fish and divert them to natural stream channel. —Elec World, Ja 1, 56

Automatic Sprinkler System Installed in Coal Tipple

Logan Country Coal Co. has just completed installation of the first automatic sprinkler sytem for fire protection in a U. S. coal-mine tipple. Tipple is of wood. Company now gets a lower fire-insurance rate.

Dry-pipe system was selected because of freezing weather during winter months. Sprinkler heads are on 1-ft. centers or closer, next to the roof and under each floor. Heads are also placed under a belt conveyor 4 ft. above the floor. Water supply is from a 75,000-gal. wooden tank on a hill above the tipple. Water for the system is at 52-psi.

When not in operation, pipelines are filled with air at 20 lb. retarded pressure because of danger of freezing. When a fixed-temperature head or rate-of-rise thermostatic release opens, drop in air pressure opens valve to let water enter lines. Piping is installed so it drains back to control station.—Coal Age, Ja, 94

Develop Free-Piston Engine

A free-piston power plant has been developed in France. It may be considered as a highly supercharged 2-cycle diesel engine with expansion extended to atmospheric pressure in a turbine.

The engine has an opposed-piston diesel cylinder at the center with single-acting, air-compressor cylinders at the ends. Burning fuel in the diesel cylinder pushes apart the opposed pistons, each of which is connected to an air-compressor piston.

Air enters through valves around cylinder walls and discharges through valves between air cylinder and a central air space. From this space, compressed air enters diesel cylinder to scavenge and supercharge it.

Sole output is the exhaust gas at 75 psi. and 900–950° F. The gas expands to about atmospheric temperature in a turbine to create useful shaft power.

The free-piston design offers these advantages: simplified construction; high permissible compression and maximum pressures without limitations imposed by bearing-load considerations; and adjustment of piston stroke and final position to prevailing conditions, thus keeping compression within reasonable limits in spite of changes in supercharging pressure.—Power, Ja, 79

Eliminates Tacking of Tricot

Sewing together selvages of tricot fabric to prevent shrinkage during dyeing is unnecessary with American Viscose Corp.'s new machine. Unit is designed to process acetate-tricot fabrics. Fabric is pre-set open width and dyed without sewing, and is extracted in the normal manner.

Tacking and untacking are eliminated. Longer yardage can be knitted—saving the time necessary to stop machine, cut fabric, and start machine. Only limiting factor to yardage is take-up roll size. Course of fabric remains perfectly straight.—Textile World, Ja, 116

Conserving Raw Materials in Foundry Practice

An important conservation practice is to avoid rejects by proper gating, molding, and pouring methods. Another is segregation of scrap. There are several ways, for instance, to segregate scrap sprues.

One is to place the alloy number at several different locations on the gates by attaching small numbered strips on the pattern. These will imprint the alloy number on the sand. Another method is to use colored chalks or paints and mark each alloy a different color at cutoff area or prior to cutoff if castings are cool enough.

Dross, skimmings, and grindings should not be thrown away. A secondary smelter can recover an amazing amount of metal from them.

When a foundry wants to use all its scrap, certain precautions should be observed. Scrap of unknown composition, oily or greasy scrap, and turnings or borings should not be melted. A smelter can handle this scrap better than a foundry. If scrap is being bought for foundry melting, it should be in ingot form of known composition.

Other conservation suggestions are to avoid overheating the metal, to add alloys just before pouring when oxidation or volatilization may be high, to improve pouring practices so as to avoid spillage, and to make better use of raw materials by proper alloy choice.—Foundry, Ja, 80

Electrical Distribution Tailored to Fit Plant Needs

The new Sandusky, Ohio, plant of New Departure Div., General Motors Corp., has made a unique application of bus duct to conveyorized production. The conveyor frame itself, as shown in the illustration, supports the duct runs.

This scheme, in many cases, brought plug-in disconnects within easy reach

LOW MOUNTING of 600-amp. duct over belt conveyor on Unistrut cross-pieces offers flexibility in use.

from the floor. All power branches are within step-ladder reach. Conduit branch circuits to individual machines are fairly short, thus eliminating the usual "forest" of conduit and cable drops inherent with truss-mounted ducts. Another advantage of this system is the low-voltage drop between substations and points of ultimate utilization.

Installation ease, as well as flexibility, was gained by mounting the duct to Unistrut supports of conveyor-bracket type and of floor type of 5½-ft. height in the machine shop.—Elec C&M, Ja, 54

Protects Machine Parts

Exclusion of dust, abrasives, and foreign particles from machine parts is necessary to retain good surfaces and high accuracy. Various types of boots are used for this purpose.

One recently developed is made of cotton-reinforced synthetic rubber. Advantages claimed for new boot are ruggedness and resistance to water, oil, grease, coolants, and high temperature. Applications include aircraft landing-gear struts, press rams, pistons, gears, and particular reciprocating parts.—Prod Eng, Ja, 106

Safe Handling Procedures Prevent $HClO_4$ Fires

Perchloric acid is hazardous to handle, the danger being possible contamination by organic material or formation of the anhydrous acid. Fires or explosions may result. Laboratory handling can be made safer by observing the following precautions:

1. Keep minimum quantity on hand and store bottles not in active use in non-combustible cabinet.

2. Carry out reactions in metal or stoneware hoods left unpainted or protected with inorganic coatings such as enamel. Wash down hoods after use.

3. Provide a generous supply of water-type extinguishers.

4. Avoid spillage. If a spill occurs, flush with large quantities of water.

5. Do not mix $HClO_4$ with organic material.

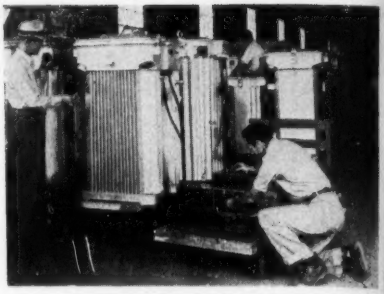
For quantity handling, workmen should be provided with safety clothing. Carboys should be mounted preferably on a raised steel track over an acid-resisting floor, dispensing areas should keep as little acid as practical on hand, and bulk storage should be examined at monthly intervals.—Chem Eng, Ja, 116

Ammonia Clock Pendulum

Using vibrations of atoms inside an ammonia molecule, U. S. Bureau of Standards has developed a new clock 100 times as accurate as other clocks. An electronic oscillator generates high-frequency waves equal to resonant frequency of ammonia. Waves are passed through tube around clock face.

Waves are absorbed if the frequency is right; if wrong, they pass through and become error signals. These are fed back to the generator, changing the frequency. The ammonia-controlled frequency can be changed by a diverter.

The clock may be used to produce more accurate radio frequencies than were previously possible. Also, it may be an aid in microwave spectroscopy—a delicate method of identifying chemical compounds.—Business Wk, Ja 15, 26



TAKES QUICK INVENTORY

Southern California Edison speeds up taking of inventory by using portable wire recorders and punched-card tabulating machines. Recorders were powered by own batteries and inverters. Recording time was 12 hr. for each of four machines, compared with 2 wk. normally required. Data from wire spools was transcribed onto cards which were compared by machine to master cards.—Elec World, D 18, 116

Microwaves Control RR Power

Long Island Railroad is using microwave beam radio, employing frequency modulation on 6,660 megacycles, for remote-control operation of a new substation. Transmission is made from two 4-ft. parabolic reflectors mounted on the roof of a station building to similar reflectors at the substation.

Transmitters, receivers, and associated devices are located on the station roof and linked to control and communication devices in the power-director office. From control panels there, switches in the substation are operated.

Experimental work is being carried on to adapt microwaves for remote control of switches and signals, as in centralized traffic control and interlocking systems. —Electronics, Ja, 150

Capital Expenditures Stay Up

That American industry is planning to spend $14-billion this year on capital equipment is taken to indicate continued prosperity of U. S. industry

UNITED STATES INDUSTRY, according to a survey conducted by the McGraw-Hill Economics Department, is expecting to invest $14.1-billion during 1949 for new plants and equipment. This figure is only 5% below the $14.85-billion expended during the preceding year, guaranteeing a high level of business in capital goods industries.

From these figures businessmen take heart, for past history has shown that when capital investments fall off business follows the trend—one-third of the industrial workers in the U. S. are employed directly on business investments.

The survey results cannot be taken as an accurate, infallible forcast. Rather, it is a report of what U. S. industry hopes it will be able to do this year and in the five-year span.

Over the five year period, 1949–53, these businessmen plan to invest about $55-billion, with the decline in the later years being surprisingly small (see table).

Much of the planning is, of course, dependant upon the political and economic complexion during these years. But the switch from the expected outcome of the 1948 national election in this country did not change the expected expenditures as might have been guessed. Figures of the survey, received before the election, were resubmitted to industry for correction. Corrections were negligible.

Although the amount spent this year will vary little from the amount spent last year, there will be a shift in the industrial distribution of the expenditures Railroads, electric utility industries, and rubber companies will increase their amounts. Gas utilities, mining, and other transportation industries plan to invest almost as much as last year. More sizeable cutbacks dollarwise will be effected by paper, machinery, electrical machinery, and chemical industries.

Industry's Five-Year Plan

(Figures are in millions of dollars)

	1948	1949	1953
Steel	685	600	330
Chemicals	1,400	1,220	1,100
Petroleum Refining	740	720	500
Machinery	900	650	580
Electrical Machinery	310	220	130
Autos	630	570	500
Transportation Equip.	135	165	60
Food	595	525	340
Other Manufacturing	2,765	2,530	1,310
Total Manufacturing	8,160	7,200	4,850
Railroads	1,345	1,520	890
Electric Utilities	1,800	2,050	1,560
Gas Utilities	880	820	....
Other Transportation & Communications	1,900	1,780	1,180
Mining	765	760	515
All Industry Grand Total	14,850	14,130	8,995

The cutbacks in capital goods expenditures are not so great as most economists had predicted. By 1953 the annual expenditures will be down greatly from 1949, begin about 65% of the current year's expenditures. But these expenditures are still two-thirds larger than annual expenditures for the period 1936–40.

At the end of the war, U. S. industry's capacity was one-third greater than it was at the beginning of the war. In the last three years the capacity has been raised 56% above the 1939 level.

With all this expanded capacity, plants are running at 90% of capacity. The general feeling is that this is 5–10% above what it should be in order to provide the most advantageous production rates and costs. Thus manufacturers hope to increase capacities about 13% in the next five years, chiefly in chemical, petroleum refining, steel, and textile industries. With the exception of chemi-

cals, the rate of expansion in these industries will decline as the five years progress.

Expenditures this year will emphasize efficiency. Whereas last year 58% of the total capital expenditures was for replacement and modernization, this year 74% will be spent on this classification of machinery. This expenditure will be reflected in productivity.

Folding Window for Car

Vinyl butyral interlayer of safety glass, used as a hinge horizontally across the rear window, gives the new Hudson car a folding window in convertible models. With the top up, the new window gives 100% more vision than standard windows. The window, made by Pittsburgh Plate Glass Co., is made of two thicknesses of 0.020 vinyl sheets, cut larger than the glass area to give a border on all sides. Cloth is sandwiched between.

In layup before curing, a 1-in. space is left between glass to provide the vinyl hinge. The vinyl butyral interlayer has twice the strength necessary for safety. —Mod Plastics, Ja, 132

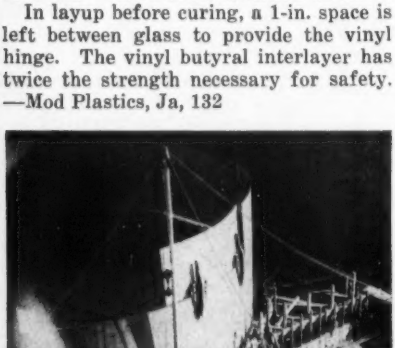


PLATE BUGGIES AID TANK WORK

Crown Tank Co. has designed plate buggies for tank-erecting jobs where space does not permit use of a crane. Buggy consists of two grooved wheels placed so they ride top edge of lower ring. Plate is lifted by gin pole to buggies, then rolled into position for tack welding.—Weld Eng, Ja, 64

Ford Increases Accuracy of Spectrographic Analysis

Ford Motor Co. has made a recent advance in spectrographic control analysis of cast iron and cast steel. It consists of obtaining representative samples by use of a molybdenum insert mold for casting of the rod samples.

Original reason for making the mold of molybdenum was its durability as a mold material during 9 months successful use in preparing furnace samples of stainless steels cast at full furnace temperature. It soon became apparent that quality of sample was of greater importance than mold life.

Why molybdenum is so suitable is not yet known. But spectrographic samples show a greater uniformity of structure, which results in a pronounced improvement in precision and accuracy of spectrographic results.

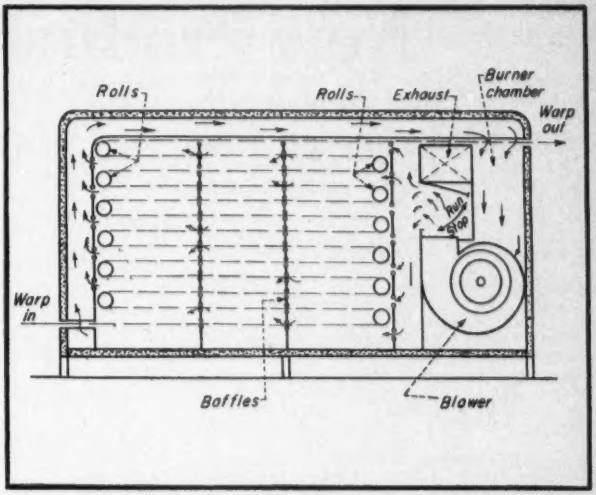
A control experiment using both cast-iron and molybdenum molds for determining phosphorus in cast iron was recently made. Average deviation for samples cast in molybdenum was only one-third that experienced with the cast-iron mold.—Iron Age, D 23, 57

Ship Flour in Air-Tight Bins

Baking flour is now being shipped and stored in air-tight aluminum bins developed by Tote Engineering, Inc. Bins eliminate danger of spoiling, leaking, and explosion. The bins hold 3,000-3,500 lb. of flour and are square to save storage and shipping space.

A specially designed spinner throws flour horizontally through top opening to assure filling of corners; then bin is jolted automatically. At bakery, bins are placed on a Tote Tilt for unloading by fork truck. Screw conveyor moves flour into bakery storage bins. Bins are rented by Tote to bakeries; unloading equipment is sold outright to them.—Business Wk, Ja 1, 24

HOT-AIR SLASHER Direct-fired, festoon-type warp drier, developed by Industrial Heat Engineering Co., employes baffles to break up flow of drying gases. The 12-ft. long 6½-ft. high unit has a capacity of 10,000 cfm. circulated by two blowers at tae front end of the unit. Yarn travels back and forth around a series of fluted rolls. Gas is reheated 25 times per min., thermometer controller regulating temperatures at any point between 200-400° F.—Textile World, Ja, 102



Incendiary-Bomb Fuel Lights Stoker-Fired Boilers

Consolidated Edison Co. of New York, Inc., saves time, fuel, and manpower by starting fires in stoker boilers with a thickened fuel. The fuel, similar to the mixture used in flame throwers and incendiary bombs, is made by adding a thickening agent, NaPalm, to light fuel oil.

This agent has aluminum palmitate as a base and constitutes about 25% of the gel mixture. The gel itself is stable in storage from –40 to 255° F., not pourable, and not an explosive.

In starting a fire, the fuel bed is covered with coal for about the first 3 ft. of its length. A trench is made in the coal about 1 ft. from the throat where the coal feeds into the furnace. The trench, running across the fuel bed, is spread wih a thin ribbon of the thickened fuel, which then is ignited by torch.

When a fuel bed is prepared with NaPalm long in advance of use, the gel seeps through the coal and disappears in a few days. This can be prevented by laying oil-proof paper the length of the trench and spreading NaPalm on the bed.—Power, Ja, 73

Taps Invisible-Star Sounds

A new radio telescope demonstrated at Cornell University tunes in on radio waves that are constantly transmitted from celestial bodies.

The "mirror" of the telescope is a 204-in. saucer-shaped reflector. As radio waves of frequencies transmitted by stars can penetrate the clouds of cosmic dust which make large areas of space opaque to optical telescopes, the radio telescope promises interesting findings.

It is designed to track with an angular error of less than ½°. In addition to the usual astronomical polar and declination axis, two other rotations are available—one about a vertical axis to facilitate antenna calibration, the other that of the 17-ft. reflector about its own axis for polarization studies.

Instrument cost was about $30,000. —Prod Eng, D, 142

New Products

Sharpens Saws—Using only two grinding wheels, Treyco Products' new saw-grinding fixture will sharpen three types of circular saws. One wheel has 45° angle on one side for cross-cut saws or fine teeth on combination saws. The other wheel is 5/16 in. wide for use on rip saws or large teeth on combination saws. Fixture both holds and turns saw. Grinding wheels and saw holder are a single unit.—Ind Dist, Ja, 120

New Mine Screen—For vibrating, rotating, or stationary mine equipment, a new screen has continuous slots for its entire length with tapered profile bars assembled with U-shaped holders. Screens are of abrasion-resisting steels, stainless steel, copper-bearing steels, bronze or brass alloys, or aluminum. Screens are a Hendrick Mfg. Co. development.—Coal Age, Ja, 150

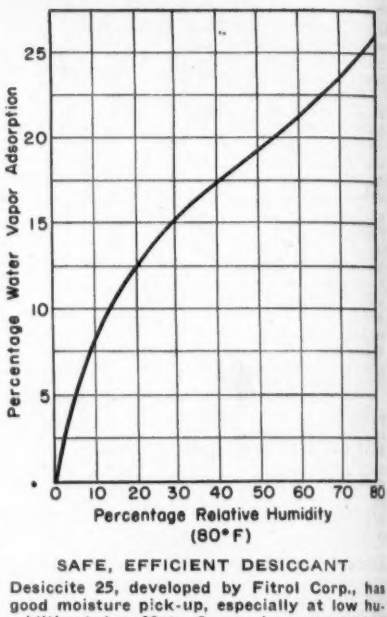
Anchor Expands—A. B. Chance Co.'s 8-way steel expanding anchor eliminates non-holding areas between blades. Controlled by a blade stop, the bladed top plate expands to form a conically shaped square that distributes holding power over a wide area.—Elec West, N, 40

Combination Blast Gun—Offered by Engineered Products, Inc., combination sand blaster and spray gun has been developed for cleaning and finishing of metal surfaces. Applications include cleaning welds and producing surfaces for tinning. Combination work is handled by two different nozzles.—Weld Eng, D, 80

Lubricates Gears—Keystone Lubricating Co. has announced a new lubricant that retains plasticity, tenacity, and density from below zero to over 400°F. It is applied by gun applicator in broad ribbon, assuring its reaching pressure side of gear teeth.—Power, Ja, 162

Powder Extinguishes Fires—Walter Kidde & Co. is offering a dry chemical powder extinguisher for flammable liquid and electrical fires. Driven by CO_2, it is discharged through hose and nozzle in a steam that carries 20 ft. or more.—Elec World, Ja 1, 82

Built-in Video Magnifier—All 10-, 12-, and 15-in. Garod Electronics Corp. television receivers will be equipped with a push-button device to blow up the 6-in. height of conventional 10-in. picture to full area of the tube face. Image is not distorted. Device is connected to receiver by a 15-ft. cord.—Business Wk, Ja 8, 52



SAFE, EFFICIENT DESICCANT

Desiccite 25, developed by Fitrol Corp., has good moisture pick-up, especially at low humidities below 30%. Curve shows amount of water absorbed at varying relative humidities. It is a montmorillonite in pellet form, absorbing water by physical means alone. It has high apparent bulk density.—Mod Packaging, Ja, 131

Electric Tire Changer—Weighing only 180 lb. and occupying little space, Bishman Mfg. Co.'s electrically-powered tire changer frees both tire beads in one operation. Wheel and tire are placed on machine and clutch is set to rim size. While tire is rotated, bead breaker handle is actuated. Changer is powered by a ¼-hp. motor.—Am Auto, Ja, 46

Hoist Has Preformed Cable—Electric hoists of 1,000- to 20,000-lb. capacities, announced by Wright Hoist Div. of American Chain & Cable Co., are of all-steel construction with preformed cable and swaged cable fittings. Furnished for lug, hook, plain, or geared trolley, they operate on 220 or 440 v.—Am Mach. D 20, 103

Low-temperature Rubber Compound—A new butaprene-based synthetic rubber compound developed by Stalwart Rubber Co. remains pliable after long exposure to extreme cold. Its permanent set is 4%; durometer hardness is 55. Unaffected by dilute acids, alkalies, petroleum products, hydrocarbons, and solvents, it is also resistant to oxidation at high temperatures. It can be extruded, lathe cut, or punched.—Aviation Wk, Ja 10, 31

Conveyor Cools Materials—Flat stainless-steel conveyor, supported on water, cools materials as they are moved. Thus molten materials entered at one end can be removed at the other end as solid sheets. Rubber strips at conveyor edges hold material on belt. It is a Sandvik Steel, Inc. development. —Factory, D, 142

Tilting Trailer—Special equipment loading ramps are unnecessary in loading or unloading heavy equipment from a new tilting trailer. Automatic, hydraulic tilting control cylinder permits trailer to tilt gradually under load. The Foster Trailer Co. development is available in tandem- or single-axle models.—Eng News-Rec, Ja 6, 90

Brings Presses up to Date—Micro Switch Div., First Industrial Corp., has announced an electrical control device called Microtrip for two-hand operation of punch presses, riveters, and spot welders. If one button is tied down, tripping circuit prevents operation until it is reset by hand.—Elec C&M, D, 101

Babbitting Furnace—No hand ladles are needed with the gas- or electric-heated Babomatic furnace developed by United American Metals Corp. Babbitt is poured directly into bearing by bottom pour valve and trough in furnace, which is adjustable vertically to suit bearing height.—Steel, D 27, 96

Converts Burner—North American Mfg. Co's unit converts ovens, furnaces, and boilers from gas to oil firing. It supplies hot air to point where gas and air are ordinarily mixed. At same point, atomized oil is introduced and vaporized so it burns in the gas burner.—Foundry, Ja, 224

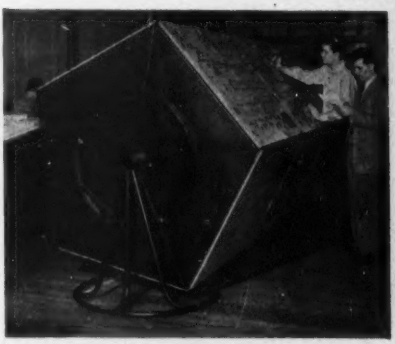
Revives Car Battery—Car batteries are kept at summer efficiencies during coldest weather with a portable Vitalizer. Developed by Lighting & Rectifier Div., General Electric Co., the 3-lb. device hangs from a steering-wheel spoke. One lead plugs into the dashboard cigar lighter, the other to a 110-v. ac. outlet. It is designed for overnight stimulation of the battery's chemical activity. It is available with either positive or negative grounding system and can be stored in the glove compartment.—Business Wk, D 25, 43

Remelt Soft Metal—Nolan Corp.'s models 650 and 2000 furnaces for remelting soft metals have regular temperature ranges up to 850°F. Both models have hinged covers and bottom draw-off valves with swing spouts, and may be equipped for electric or gas heating.—Iron Age, D 23, 72

Composite Weld Stud—Composite aluminum and mild steel Rivweld rivet stud overcomes corrosion problems met when aluminum roofing is secured by steel fastenings. It is made by Nelson Stud Welding Div., Morton-Gregory Corp.—Weld Eng, Ja, 73

Nickel-cadmium Battery—The Nicad battery, made by Nickel-Cadmium Battery Corp., features long life. Active material is nickel hydroxide and treated graphite for positive plate, while negative plate is mixture of cadmium and iron oxides. Electrolyte is caustic potash in distilled water.—Power, Ja, 122

Spaces Tie Plates—Positioning single- or double-shoulder tie plates is simplified by Wollery Machine Co.'s new plate spacer. One side of unit rides rail on two rollers, being restrained against lateral movement by five guide wheels. Other side is an angle iron sliding longitudinally on top of previously placed tie plate. It acts as a stop block against which tie plate shoulders are positioned. Tie plates are positioned by special tool.—Railway Engrg & Maint, Ja, 71



SAVES OFFICE SPACE

Pentagonal plant-layout board at International Harvester Co.'s Indianapolis Works saves office space by having layout wrapped around pentagonal frame. Unit rotates on ball bearings and is held in any position by brake acting on 3-ft. ring welded to end plate. Faces are plywood covered with ½-in. composition board soft enough for tack insertion.—Am Mach, N 18, 99

New Products (Cont.)

For Nylon Stripping—Textone, a sodium-chlorite product developed by Mathieson Chemical Corp., permits almost complete dye removal from nylon without damage to fiber. It may also be used for partial stripping. After 30 min. in bath, fabric is rinsed and is ready for redyeing. An acetic-acid and synthetic-detergent-bath precedes stripping bath.—Textile World, Ja, 226

Automatic Meter—An industrial meter designed to replace volumetric measuring tanks for liquid batch operations is offered by Buffalo Meter Co. Electrical contacts in meter control liquid volume, shutting off flow when predetermined amount has passed. —Chem Eng, Ja, 142

Carbide-tooth Concrete Drill—Side exhaust slot on Tilden Tool Mfg. Co.'s new concrete drill permits core particles to escape. Carbide teeth are on core perimeter. Drill will cut ¼- to 2-in. holes at a rate of 2 in. per min.—Cons Meth, Ja, 87

Hydraulic Platform Truck—Offered by Elwell-Parker Electric Co., 20,000-lb. platform truck has four sets of wheels under 12-ft. by 32-in. platform. Hydraulically powered steering mechanism enables operator to turn in 99½-in. aisle intersections. Power is all electric or gas-electric.—Steel, Ja 10, 95

CHECKS FUMIGATION RESULTS

Insect test cage has been developed to provide easy means to make progress checks of fumigation results in feed, food, and other stored materials. New cage, made of metal or plastic, resembles sharpened pencil. It has slitted openings 0.010 in. wide and ¼ in. long to allow gas to reach insects. Insertion tube, screwed to cage, is thrust into carton or bag. Proof of fumigant penetration into material is unmistakable when caged insects are found dead in cage.—Food Ind, D, 109

Concealed Signal Bond — Of hard-drawn bronze, a new concealed, plug-type signal bond does not require removal of the splice bar during installation. When in place, bond is behind splice bar except for stainless-steel terminals. Rail bond has high fatigue resistance. Hanlon & Wilson Co. developed it.—Railway Sig & Comm, Ja, 56

Iron Hand Unloads Presses—The Iron Hand, offered by Sahlin Engrg. Co., automatically removes stampings from straight-side presses. It is a portable unit and can be timed to operate during any part of ram upstroke. It can be arranged to lift stamping vertically before swinging it out, thus eliminating need for spring or air liftouts in lower die.—Am Mach, D 16, 144

Metal Cleaners—Hanson-Van Winkle-Munning Co. has announced four new cleaners: 20-W for soak cleaning aluminum or zinc-base die-castings; 25—a caustic base cleaner for etching aluminum; 30—a silicated caustic base with no foaming or wetting agent so it can be used in spray washer; and 50-W for soak cleaning magnesium.—Prod Eng, Ja, 180

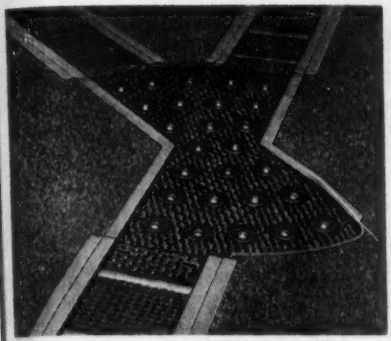
Conveyor Line Marker—A new conveyor marker, developed by Wm. A. Force Co., can be used horizontally or vertically for dating, coding, or marking goods for production control. Printing roll is 1 in. wide. Interchangeable type permits rapid changes in dates, lot numbers, and product name.—Ind Dist, Ja, 140

Regulates Voltage—New electrical damping system, developed by Allis-Chalmers Mfg. Co. for rocking-contact-torque-type generator voltage regulator, provides increased sensitivity and quick response. Damping mechanism is a separate assembly designed for rear-of-board or remote mounting—Oper Eng, Ja, 72

Oil-field Engine—D. W. Onan & Sons, Inc.'s two-cylinder, air-cooled pumping engine develops 1,000 in.-lb. torque with 960-ft. piston speed. It is rated at 5½ hp. continuous duty. Operation is possible on both gasoline and natural gas.—Oil & Gas J, Ja 6, 97

Spray-on Car Wax—Using a standard spray gun, Clinton Spray Wax Co.'s automobile wax speeds waxing. Liquid dries in 1 hr., giving a hard, shiny surface.—Am Auto, Ja, 49

Electron Diffraction—Radio Corp. of America's model EMD-2 unit permits chemical analysis of substances weighing as little as 1/28-millionth oz. It reveals composition and atomic arrangement by directing beam through minute specimen onto either fluorescent plate or photographic print.—Electronics, Ja, 177.



FLOOR CONVEYOR SWITCH

Angular fan-tail switch and in-floor conveyors simplify movement of materials about the plant. Load is turned on movable balls rather than on rollers. Trackage and switch require only 4-in. depth. It is an Engineering Products Co. development.—Factory, Ja, 168

Resistance Thermometer—A new rapid-response element, called RdF Stikon, consists of nickel-wire grid bonded into paper-thin Bakelite wafer. Bakelite cement attaches wafer to surface of interest. Offered by Ruge-de Forest, elements are intended for range from −40 to +300°F.—Electronics, Ja, 180

Non-Ionic Detergent—Atlas Powder Co.'s new detergent, Renex, is derived from vegetable- and petroleum-base materials. It is non-ionic, neutral in pH, harmless to delicate fabrics, and intended for use in laundries and in textile processing.—Chem Eng, Ja, 168

Detects Thin Cloth Spots—Thin spots in cloth are detected by a new electrical detector. Feeler presses against cloth. When a thin spot is reached, it drops through cloth, making electrical contact to stop loom. It can be used only on looms equipped with electric stop motions. Detector is a S. B. Shelton Corp. development.—Textile World, Ja, 150

Combination Meter—General Electric Co.'s type IHM-1 is single-phase watthour and thermal watt demand meter for industrial use where both energy and demand must be determined. Watthour unit has new damping system and electromagnet, while thermal unit is designed on "direct heat" operating principle.—Elec C&M, Ja, 75

Cleans Highway Joints—Joints in highways, runways, parking lots, and ramps are rooted out and new joints cut by a self-propelled joint-groover developed by G. H. Tennant Co. Groover's cutter head can be varied for joint width of ⅜-2¼ in. and depths up to 1¼ in. It can clean up to 20,000 ft. per day.—Business Wk, Ja 15, 58

Wood Shaper—Vertical-spindle shaper, offered by Atlas Press Co., has a 15x21-in. table, 2-in. vertical travel, and ½-hp., 3,450-rpm. motor. Cutter is 1½-in. high with ½-in. bore. Machine is portable.—Am Builder, Ja, 116

Tests Abrasion Resistance—Developed by Taber Instrument Co., model 100-109 has various wheels for testing porcelain enamel, organic coatings, leather, glass, plastics, and woven fabrics. Wear results from rubbing flat faces of two wheels over surface tested.—Prod Eng, Ja, 169

Jet-Centrifugal Pump—Combination centrifugal pump and jet ejector has been developed for relatively small capacities against high pressures. Gould Pumps, Inc.'s, units range from ¼ to 5 hp. with capacities up to 35 gpm. and pressures to 190 psi.—Food Ind, Ja, 156

Portable Fire Extinguisher—Operated by a finger trigger, Bostwick Laboratories' 16-oz. hand fire extinguisher has an effective 18-ft. pressure stream. Extinguisher fluid is 90% carbon tetrachloride and 10% other chemicals.—Cons Meth, Ja, 98

Moves Bulk Material—New Honan-Crane Corp. conveyor transports any material that will settle to bottom of tank, hopper, or bin. It consists of a series of Neoprene or cast-iron flights on endless chain pulled through pipe casing by high-torque gear transmission. Sizes are 2, 4, or 6 in. of casing diameter.—Iron Age, Ja 13, 65

Novel Diamond Case—Of clear, molded acrylic, Schless-Harwood Co., Inc.'s new case for diamond engagement rings is diamond shaped. Case is molded in two halves, hinged at back. Ring sits in a plastic base inside the plastic case. Base is of black acrylic for contrast.—Mod Packaging, Ja, 118

FREE SERVICE TO READERS

As a special service to our subscribers, McGraw-Hill Digest will furnish, without any charge, additional information about any new product or technical development described. Address your letter to: The Editor, the McGraw-Hill Digest, 330 West 42nd St., New York 18, N. Y., U. S. A. ***—THE EDITORS***

Making Resin from Coal

Combined Metals Reduction Co. derives widely used resins by flotation principle as a byproduct of regular operation. Hexane used in multi-step

REFINED RESINS—for future use in adhesives, varnishes, printing inks, rubber cement, and other synthetic products—are being produced from bituminous coal by Combined Metals Reduction Co. as a sideline. Material occurs in coal bed fractures up to ¾ in. thick. The resin is separated by flotation.

Air and a reagent are added to coal slurry feed in the washing plant to bring concentrate to 60% resin. This is skimmed off by drag belt. Concentrate is carried to the refinery to be dried, bleached with hexane, filtered, evaporated, melted, and cast for shipment.

At refinery, wet concentrate is pulped and pumped to a twin-leaf filter, discharging to a hearth-type drier heated by steam.

Liberated moisture is exhausted by fan, fresh air entering through ports in the hearth. Concentrate is dried to under 5% moisture content and stored in 25-ton explosion-proof bins.

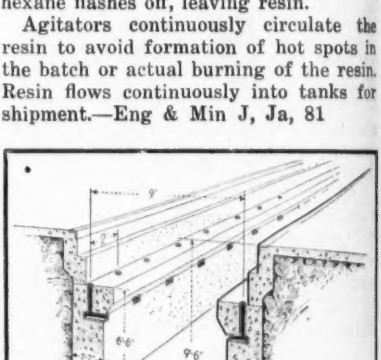
The concentrate is metered to pulping tank and mixed with hexane, which is used because of its relatively low evaporation temperature. Hexane dissolves the resins in 4 hours in one of three leaching tanks. The resin-bearing liquor is removed from the mud by pressure filters operating at 25-lb. pressure.

Filter is a series of segmented disks, enclosed in a horizontal pressure tank. After the entire batch from one leaching tank has been filtered, cake is washed twice by wash liquors. First liquor off becomes leach liquor, the second being the first wash of the next batch.

Mud remaining on filters is washed off by hexane into a mud storage tank below filter. Diluted with water, this mud is pumped to a second tank where hexane is recovered by adding live steam, leaving the mud and water slurry which flows to an outside skimmer tank. The mud, mostly fine coal and insoluble resin, is skimmed off and discarded. The dirty water is pumped back to the boil-off tank to pick up more mud.

Liquor from the filter is classified, then evaporated. Evaporator temperature is kept at 60–70° C., driving off at least 65% of the hexane. Liquor then passes to a melting tank where melted material is held at 225° C. As the liquor flows from the evaporator into the melter, hexane flashes off, leaving resin.

Agitators continuously circulate the resin to avoid formation of hot spots in the batch or actual burning of the resin. Resin flows continuously into tanks for shipment.—Eng & Min J, Ja, 81



CONTINUOUS PRESS FOUNDATION

Layout changes are simplified in Norris Stamping and Mfg. Co.'s plant by a 560-ft. long continuous press foundation. Cross-section was determined from composite cross-sectional drawing of all presses, including die cushions and auxiliary equipment. Tie-bolt positions at regular intervals accommodate any required press location. Cross members are supported on rails in concrete structure. Relayout can be made in 24 hr. and at 10% of cost with separate foundations.—Am Mach, D 30, 71

Electronics Can Control Pasteurization Temperature

In milk pasteurization, every particle of milk must be heated to a certain temperature (usually 162° F.) for a specified interval. The temperature must be held within close limits.

In one system the controlling unit is a variable impedance bridge actuated by a bulb and bellows arrangement. Output of unit, resulting from flux unbalance in unit's coils, is fed through suitable amplifiers and rectifiers so a direct current proportional to milk temperature is produced. This current energizes the control coil of a saturable reactor, which in turn determines the heating-element current.

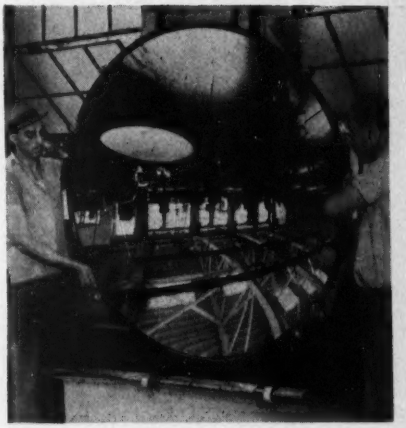
The 3-phase unit has two main parts—one consisting of two large power tubes, the other of three vacuum tubes and circuit elements. This network controls the grid of one of the power tubes, and output of power tubes is fed to the dc. portion of the saturable reactor.

With increase in milk temperature, the direct current to saturable-reactor's control coil decreases, voltage drop across ac. windings of reactor increases, heater voltage decreases, less heating occurs, and temperature returns to its correct value.—Electronics, Ja, 158

Mud Acid Removes Mud Cake

Use of mud acid ahead of cement in more than 250 cement-squeeze jobs on oil wells since May 1948 indicates its growing acceptance. Action of Dowel, Inc.'s mud acid, essentially a hydrochloric-acid solution, is to remove mud from oil- and gas-producing formations.

Mud acid ahead of cement effectively removes the mud cake from the wall of the hole and leaves the formation face clean. Technique of using mud acid is relatively simple. With cement retainer in position and bypass open, 5–10 bbl. of water are fed into cementing string.



ELECTROFORMS REFLECTOR

Particular electroforming application is fabrication of this searchlight reflector. Master glass mold is made conductive by thin film of silver. Nickel is electroformed on mold, and copper over the nickel. When shell is electroformed to desired thickness, it is separated from mold, silver is removed, and nickel surface is plated with rhodium 0.00003 in. thick for reflectivity.—Prod Eng, D, 86

Water is followed by 500 gal. of mud acid and another 5–10 bbl. of water. Last slug of water is followed by the cement. When acid reaches bottom, circulation is stopped by setting retainer or closing bypass, and normal cement-squeeze procedure is followed until the job is completed.—Oil & Gas J, Ja 6, 62

Road Heated by Springs

Oregon State Highway Comm. used natural springs to provide hot water for a road de-icing system in Klamath Falls, Ore. Hot-water and antifreeze mix circulated through wrought-iron pipes will melt 1 in. of snow or 0.1 in. of ice per hr. Pump starts circulating water through system when temperature reaches freezing point. Another pump draws water from the natural springs. —Business Wk, Ja 1, 38

Well-Head Control Valve

A surface safety valve, designed to close against tubing pressures of 1,800-1,900 psi., recently was incorporated in a well-head hookup on a Phillips Petroleum Co. oil well. Its purpose is to assure an automatic shutoff in event of line break.

The valve mechanism was substituted for the bonnet, stem, and wheel of the upper gate valve, and is installed just above the tubing gate valve. The safety valve is operated by differential pressure through a spring-loaded pilot valve.

Compression in the spring pushes the ball off its seat when flow-line pressure drops, as would be the case when the line breaks. This allows pressure from the lower side of the valve piston to escape to atmosphere and causes the pressure differential to move the piston forward and stop the oil flow.

When the valve reaches its closed position, its upper stem is engaged by a locking device which holds the valve closed, regardless of pressure conditions. Oil & Gas J, D 16, 82

Recovers Smelter Dioxide

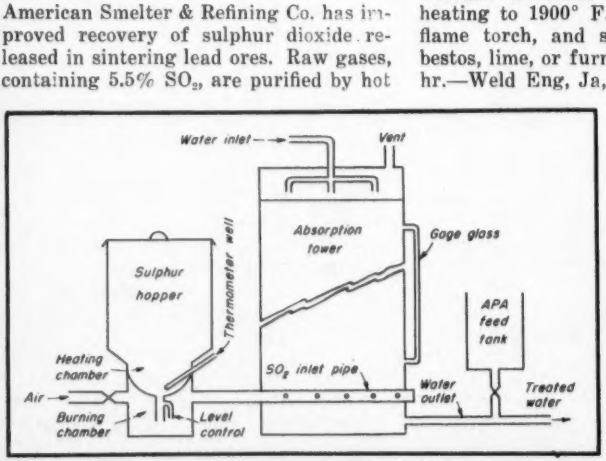
American Smelter & Refining Co. has improved recovery of sulphur dioxide released in sintering lead ores. Raw gases, containing 5.5% SO_2, are purified by hot Cottrell, scrubbing towers, mist Cottrell, and a coke filter. They are used in manufacture of H_2SO_4 and liquid SO_2.

In SO_2 unit, anhydrous dimethylamine absorbs 15% SO_2 in an eight-tray column. Absorption and desorption are accomplished in separate steel bubble cap columns. Desorbed SO_2 is rectified, cooled, and passed through column countercurrent to 98% H_2SO_4. This produces SO_2 of low moisture content.—Chem Eng, Ja, PPI-5

Hard-Facing AISI 400 Steel

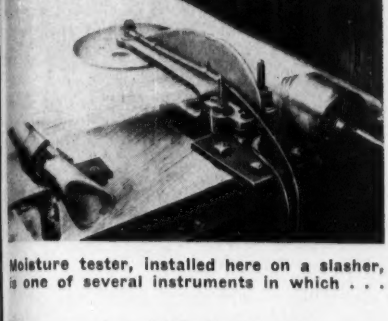
American Iron and Steel Institute (AISI) 400 series are 11–13% chromium martensitic stainless steels which have been heat-treated to produce the best wear-and-corrosion resisting properties. Until recently it has been considered impossible, in hard-facing them, to obtain a sound deposit free from cracks and checks.

A successful method is hard-facing with powder, applied by a metallizing gun. The surface is cleaned, blasted with steel grit, and sprayed with the hard-facing powder in a thin, even coat. Powder is fused to base metal by heating to 1900° F. with a large multi-flame torch, and slowly cooled—in asbestos, lime, or furnace at 50-150° F. per hr.—Weld Eng, Ja, 40



CONTROLS pH

Cooling-water pH, if too high, leads to corrosion. It can be reduced by adding SO_2. Sulphur is burned and SO_2 piped into absorption tower where it is absorbed by cooling water. To reduce pH, 0.32 ppm. of S when burned neutralizes 1 ppm. of alkalinity expressed as $CaCO_3$, making process cheaper than use of H_2SO_4. —Chem Eng, Ja, 95



Moisture tester, installed here on a slasher, is one of several instruments in which . . .

Electronics Aid Accuracy in Textile Measurements

Velocity of propagation of compressional sound waves in fibers and other materials can be measured nondestructively with a new pulse propagation meter. Velocity squared multiplied by material density then gives the instantaneous modulus of elasticity.

The instrument, made by the Magnetic Amplifier Corp., uses a magnetostrictive transmitting transducer and crystal receiving transducers with edges resting on test material. A pulse applied to the first transducer sends a short acoustic pulse through material to crystal pickup. Travel time is measured electronically to give velocity.

Moisture content of yarn moving through a slasher can be sensed by two circular electrodes and shown in percentage by the Fielden Electronics, Inc.'s Drimeter. Operation depends on detection of capacitance changes in a condenser through which material moves. Capacitance increases with moisture content. By elimination of overdrying, the instrument can increase slasher or dryer output by 25%.

Another electronic instrument, the SERC Electron Micrometer made by Standard Electronics Research Corp., checks size and denier variations of yarn or thread at speeds up to 800 fpm. A light source and phototube form the sensing element.

Electronics also have been applied to tensile testing. Application of a General Electric electronic constant-rate-of-load control unit to a pendulum-type tester made by Scott Testers, Inc., minimizes variations in results and avoids shock loading. Another tester, developed by Instron Engrg. Corp., provides a constant rate of elongation during testing. —Electronics, Ja, 126

Grain Unloading Speeded by Mechanical Car Tilter

Use of a mechanical grain-car tilter, developed by Link-Belt Co., at Great Northern Railroad's Lake Superior elevator permits unloading of 15,000 bu. of grain per hr. Unloader is essentially a concrete pit below ground level—grain-car length—and a 52-ft. long tilting platform for end and sidewise tilting of car. Unit is powered by four electric motors, the largest being 30 hp. One man controls the mechanism.

Two clamps, one at each end, hold car during tipping. First 15° side tilt removes 20% of the grain. An end tilt to 40° removes 50% of the load; car is then tilted to the other end removing an additional 25%. To remove the remaining 5%, a power-operated deflector blade is passed through the grain door. Car is again tipped.

Cost of labor is decreased and turnaround time of cars at elevator is shortened.—Railway Age, Ja 1, 20

Form-Fitting Finisher

Metal, wood, or ceramic surfaces can be finished easily with a new air-cushioned finisher. Wheel core is covered with a pneumatic drum holding up to 10-psi. air pressure. Standard 3½-in. sanding, grinding, or polishing bands fit over drum. Inflation pressure is increased with flatter surfaces.—Science Ill, F, 61

New Insecticide Provides Long-Lasting Protection

Pyrenone, an insecticide recently introduced by U. S. Industrial Chemicals, Inc., is effective in giving immediate lethal action and residual protection against many types of insects. It is a combination of piperonyl butoxide and pyrethrum.

Ingestion is not necessary; the insecticide kills by contact or absorption. Also, it does not repel insects. Both ingredients are recognized as non-toxic and non-hazardous. The mixture controls flies, mosquitoes, roaches, ants, mites, skippers, and other pests.

Pyrenone can be applied as: space treatment from sprayers or from liquefied-gas or thermal aerosols; long-lasting surface deposits on areas where insects crawl; and powder or dust in inaccessible places.—Food Ind, Ja, 58

Motion-Study Lab Pays

Standard Telephones & Cables, Ltd., England, uses its motion-study laboratories not only to test new production procedures but also to train operators in those procedures. Worker prejudice against new methods is eliminated after he is shown he can do more work with no more, and probably less, energy. Operator's training period in the lab may run to 3 weeks.

If found inept at the new procedure, employee is transferred to a job where his handicaps will not be a disadvantage. —Factory, Ja, 144

Build Light Seawall Fast

To build a U-shaped, man-made island extending into Biscayne Bay, Florida, contractor used precast slabs supported by pile-driven rails to form the seawall. Waterfront of the islet is 10,000 ft. Work proceeded at the rate of 500 ft. per day. Vertical load of bulkhead is taken by 90-lb. rails, shod with 6x6-in. plates, pile-driven 10 ft. into bedrock on 10-ft. centers. Shoreward of the rails are hung 10x10-ft. precast reinforced slabs. Slabs taper 6 in. to 4 in. top to bottom and are shimmed 2 in. off rail base. Horizontal load is carried by 30-in. dia. deadmen buried 20 ft. inshore from each rail.—Eng News-Rec, Ja 6, 54

Air Diffuser and Lights Blended with Decoration

Air-conditioning design principles for locating air-diffuser outlets generally place them at same points where lights should be. So the two may be combined to create decorative effects.

One way is to suspend the luminaire from the center of the air diffuser. Another is to make the diffuser the center feature of illuminated circular ceiling domes, indirectly lighted.

When low-level lighting is adequate, the cove can be located at the inner circle of the dome. When more light is needed than can be obtained from lamps installed around the circumference of the inner dome circle, the cove may be placed at the larger-circumference outer circle. Lamps may be wired for alternate control to provide unusual color-lighting effects.—Elec C&M, Ja, 46

Speeds Long-Distance Calls

American Telephone & Telegraph Co. has installed electronic long-distance dialing systems in three U. S. cities, linking 300 points in the country into a fast long-distance phone network. With the new system, it should take less than a minute to put a call through.

Operator pushes coded numbers to designate the city called, the exchange, and the number—then pushes "start" button. When pushing numbers, the operator energizes an electronic "voice" that controls the electronic "brain." The brain selects the circuit to be used for the call.—Business Wk, Ja 15, 44

FINAL ASSEMBLY at Hotpoint's electric-range plant combines a variety of materials-handling equipment, all completely integrated to show . . .

How Materials Handling Affects Plant Layout

For top production at minimum cost, prime requisites are good layout and effective handling. The two are inseparable for efficient manufacturing

—Report to Management—

MATERIALS HANDLING, the greatest single item of indirect factory expense, is a major management concern. It also is an inherent part of plant layout. Thus, a study of one invariably leads to analysis of the other.

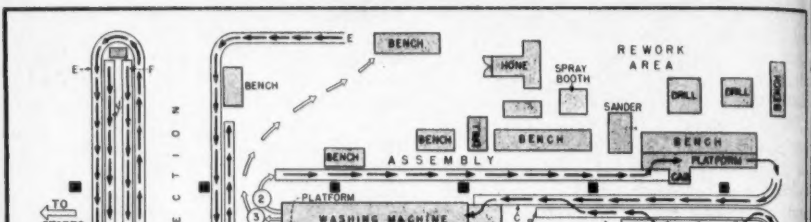
In approaching a layout problem, two basic situations are met. The first is making a layout for an entirely new plant. The second is rearranging an existing plant.

In a new plant, materials handling is a major factor in determining layout. It affects department location, machine placement, space allocation, and building design. In an existing plant, the extent of its effect depends on possible savings and on whether handling methods are to be revised by department or plant-wide. The modernization situation is more commonly encountered.

The basic concept in layout is flow. Factory buildings should be considered as integral production units channeling a smooth flow of materials through manufacturing processes. Thus, the prime consideration in layout is to satisfy the needs of materials handling in a way that will result in maximum productive efficiency and lowest unit cost.

The over-all objective is direct-line flow, so materials with greatest handling demand travel shortest distances in minimum time. Direct-line flow means progressive travel from one end of the plant to the other—in a straight line, or in a U-shape, or in a series of U-shapes. But in any case, back-hauls, cross-flows, and congestion points should be avoided as much as possible.

Over-all flow depends on department location in relation to operation sequence



PARTIAL LAYOUT at Wright Aeronautical Corp. of a product line shows direct, although not straight, material movement. Parts enter on conveyor A, pass to conveyor B after honing, again pass to A for grinding, and on B and C to washing. Parts pass (1) through inspection and washer a second time. Clean work travels path (2) through assembly. Assemblies move through washer and then (3) on skids to conveyor E for inspection. Rejects are returned on F to rework. If not repaired, rejects move on J into crib for attention of inspector. Wide spacing allows supplying hones from aisles.

and to fixed points. Flow within departments, in the same way, depends on their internal arrangements. Both can be satisfied by good layout, which at the same time should permit good handling methods. Not only should a project provide good handling between work points; it should also eliminate unnecessary handling at the workplace in accordance with motion-economy principles.

The goal of plant layout is one that fulfills the needs of a handling system that will:

1. Enable low-cost machine operation by keeping adequate material supply on hand to avoid downtime waiting for parts and by delivering material within easy reach to avoid lost motion in the operating cycle.

2. Provide low-cost handling by eliminating operations through modern methods and increasing labor productivity.

3. Protect work from damage in transit.

4. Permit close inventory control.

5. Afford adequate safety to employees.

6. Obtain effective utilization of cubic space.

7. Make possible lower over-all time of production.

Effective planning requires complete data on the problem. From them, improvement possibilities can be noted, costs computed, savings estimated, and a decision made for each of various choices as to its economic justification.

In analyzing the handling problem, data can best be collected by classifying a plant into areas—receiving, storage, manufacturing, departments, warehousing, and shipping. Classification enables the engineer to study each phase individually and determine the best method for that area. The various proposals can then be integrated into one over-all system.

Similarly, within an area, the engineer can study each handling sequence by itself and also in its relation to other

sequences. Important to watch for is the small percentage of items that frequently comprise a large percentage of the handling. Quickly selecting these parts or materials simplifies the whole analysis.

Data for the particular workpiece under handling analysis may be recorded on a conventional flow chart. Necessary information includes: nature of material and load, handling required, number of men, performance time, units in load, weight of load, origin and end of each move, distance, moving time, rate of material use, number of moves, and height of tiering.

From these data, flow diagrams can be drawn on the floor plan to outline the route and to translate distance into a flow pattern.

Plant Layout Procedures

The following technique applies to an existing process in an existing building. If a new process is involved, the same steps are necessary but the data are based on estimates from working drawings. With a new building, the procedure is similar but even simpler, because physical building limitations may be avoided.

Although the result of a layout project is a composite arrangement of facilities linked by an integrated handling system, layout technique consists of a study of details. The major steps are:

1. Complete survey of the operation.
2. Classification of data.
3. Determination of equipment needs.
4. Computation of space requirements.
5. Allocation of area.
6. Internal department layout—receiving, raw stores, manufacturing, processing, in-process stores, assembly, inspection, warehousing, shipping, other areas.
7. Cost estimates.
8. Final drawings.

The first step—collecting complete information about the manufacturing process for which the layout is to be made—involves several substeps. These are (1) determine production requirements; (2) break down product into sub-assemblies and component parts; (3) decide whether part is to be made or purchased outside; (4) list all operations for each part, subassembly, and final assembly; (5) determine material requirements; (6) note operation times; (7) list machines for each operation; (8) record tools, special fixtures, and attachments; (9) list any special requirements of the work.

Determining Equipment Needs

Equipment needs can then be determined by classifying data on basis of product or operation, computing machine outputs, and selecting proper number of machines for balanced output. General arrangement is then planned, and production scheduling on equipment is set up.

Space requirements are established without regard to internal department arrangement. One way is to compute the total from size and number of machines plus an allowance for aisles, work areas, and work-in-process stores. A second method is to use area figures of present departments, adjusted to allow for proposed changes.

A simpler method for determining machine needs and space requirements is particularly applicable to jobbing operations. First, all equipment and machine loadings are tabulated. Any unbalance in loadings is studied to find out whether work assignments can be shuffled to restore balance or whether additional units are needed.

Production Allowance

If a production increase is expected, its effect must be evaluated in terms of loading. If machines currently are close to top capacity, allowance must be made in equipment schedule or space must be reserved for adding other units as required.

Actually this method is simply a different approach to getting the data required for layout. Rather than working

from the product and an operation basis to build up to equipment needs, operating conditions within each department are noted and a judgement is made as to adequacy of current equipment for the given volume.

Adjustments are then made to eliminate present poor conditions and to allow for future volume changes. Space requirements are similarly determined from existing arrangements with corrective adjustments allowed. Remainder of layout procedure is the same for both approaches.

Area Allocation

The fifth step—allocation of area—fits the sequence to existing space. Complete data regarding physical characteristics of the area must be compiled. These include permissible floor loads, strength of roof structure, and any other limiting factors in the building.

Also required at this stage is an outline drawing of the plant, showing location of columns, partitions, doors, windows, and other structural features. Estimated departmental areas can then be allocated to given sections of the building. This may be done by blocking out the area and superimposing it on the desired section to check for fit.

It is in this step that the over-all flow plan is determined in accordance with the general objectives already explained. It is here that the handling analysis finds its use in formulating the plant layout.

Departmental Layout

When departmental locations have been fixed and the flow pattern is established, internal arrangements are laid out. *Specific handling methods* must be known at this point. Templets or preferably scale models are used to express spacial needs.

Making the detailed layout for each department is not a one-man job. It is a task in which line supervision and staff executives should participate. Suggestions should be pooled in an effort to arrive at the best possible arrangement.

The handling consideration, as previously stated, is of paramount importance to effective layout. One thing should be remembered: for nearly any handicap that an existing building may present, there is some form of handling equipment that will alleviate it and allow the proper layout to be made.

In adapting the right equipment to the right job, certain physical characteristics of the factory building must be considered. These include aisle widths, permissible floor loading, composition and condition of floors, elevator capacity, doorway heights, headroom, travel clearance, and location, height, and load-carrying ability of supporting beams and lower chord trusses. All such details vary on every job, so no attempt is made here to make specific recommendations.

Warehousing—Operations in receiving, stores, warehousing, and shipping are predominantly handling. Use of power equipment, handling in unit loads, and avoidance of rehandling are chief elements of good practice in these areas.

In stores and warehousing, objectives are to obtain maximum utilization of space, to segregate material, to provide accessibility to it, and to enable close inventory control. These are obtained by good layout, adequate racks and bins, and material containers or other load units that permit high stacking.

Thus, if the stacking system is to be based on use of pallets, certain requirements related to physical layout must be considered: pallet size and space between columns, stacking height available, and permissible floor loading.

Column spacing should be some multiple of pallet size, plus an allowance for side clearance. Too little space between stacks makes it difficult for the truck operator to position pallets. Time saved can pay for extra space cost.

There is, however, little information available as to exact amount of clearance needed. Clearance of 3 or 4 in. between stacks is reasonable, although some ma-

terials-handling engineers recommend as much as 6 in.

In addition to effective use of floor area, maximum utilization of cubic content should be planned. This involves density of material, pallet dimensions, height of unit load, ability of packages to resist crushing, clearances under sprinklers and other ceiling fixtures, and resulting floor loads.

Manufacturing — The two principal types of manufacturing layout, especially in metalworking plants, are process and product. In the former, departments are set up on the basis of the production process. All like machines are grouped in one area. Raw material is transformed into a completed part by passing in batches from one department to another in whatever sequence is dictated by operations.

In a product layout, all equipment to produce a given unit is arranged within a department in the proper sequence. Material moves in a direct line from first operation through successive steps to completion.

Advantages of process layout, compared with product layout, include lower machine investment, better possibility of keeping machines in constant operation, greater flexibility, more skilled supervisors, lower unit cost when production drops, and less holdup of operations from machine breakdown.

More Materials Handling

Disadvantages of process layout are more materials handling, more backhauling and cross-flows, more difficult production control, greater total time of production, higher work-in-process inventory, and greater space required per unit of product. Advantages and disadvantages of product layout are the opposite of those for process layout.

Practically all disadvantages of process layout arise from handling. Chief considerations are (1) ample terminal areas for in-coming and out-going materials, (2) adequate facilities and space for moving materials to and from each machine, (3) proper space for containers, and (4) delivery of work for economical machine operation. The last point requires recognition of motion-economy principles on units fed manually.

The handling equipment — conveyor, truck, etc.—should deliver materials direct to the area or within easy reach of operator, and may preposition the part for the subsequent operation. This provides a smooth motion pattern in the operating cycle, thus permitting maximum production and reducing worker fatigue.

Fundamental Layout Ideas

Machine layouts radically different from the conventional straight-line arrangement have resulted from two fundamental ideas. One is to put down a part in the position at which it will be picked up for the next operation. The other is to utilize idle operator time during power operations—as cuts under power feed on a machine tool.

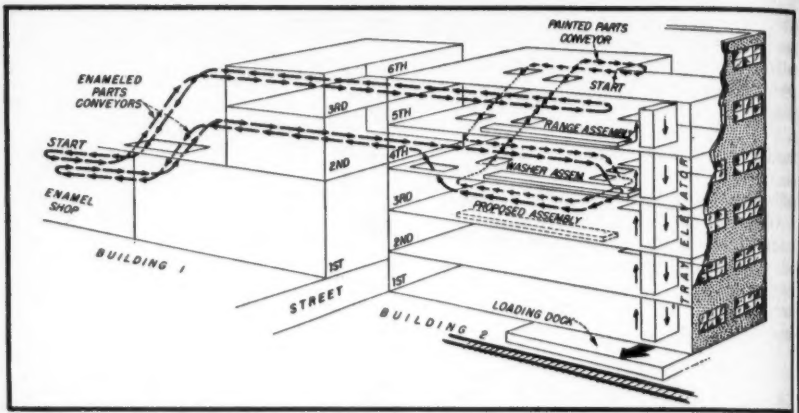
From these concepts have come roughly circular layouts with two or more machines on the perimeter and one operator inside. Despite its cluttered appearance, the layout is highly efficient in use of men and machines ,and requires no work-in-process storage space at each machine.

Processing—Layouts can readily be made to adapt processing operations to mechanical handling. They can afford automatic movement of parts through complete processing systems with manual operations only at the start and finish.

For lower production levels, systems can be devised that are not automatic but yet avoid costly rehandling between operations.

Assembly—Layouts for assembly fall into two groups—unit and progressive. In the former, major parts and subassemblies are accumulated at one area for final assembly. No great problems are involved.

In progressive layout, parts and subassemblies are placed at adjacent work sta-



MULTI-STORY buildings at Landers, Frary & Clark house facilities for manufacture of Universal electric ranges and washing machines. This flow chart shows a portion of the plant material movement. General movement is from left to right, with modern materials-handling equipment overcoming obstacles set up by necessary vertical and horizontal moves. Good use is made of cubic content of building.

tions in sequence of assembly and the product is built by passing through consecutive workstations. This is the popular layout for mass production of automobiles, stoves, radios, and numerous other products.

Three basic problems are involved:

1. Moving assembly from station to station.
2. Supplying material to each station.
3. Transporting finished product from the line.

The first is commonly solved by using traveling fixtures, as an airplane wing-panel fixture on an overhead conveyor. Solutions to second and third require close correlation of handling and production. Parts, for instance, are often brought in on overhead conveyors that also serve as storage conveyors, or on floor-type conveyors feeding at right angles to the main assembly conveyor.

Over-All Planning—Handling in all departments must be coordinated to keep materials moving with a minimum of handling and halting. This control of materials, made possible only by good layout and modern handling equipment, permits a long step toward ideal production. How all the foregoing principles are applied is shown in the two following case studies.

Handling Integrates Layout in Existing Building

Feeding bulky parts through a multi-story building to assembly lines on the upper floors is not easy. Further complicating the problem at the plant of Landers, Frary & Clark (above) was the need for supplying a large variety of components to stations along the line.

To be able to sell in a highly competitive market—appliances, ranges, and washing machines—made low-cost production necessary. Existing layout was therefore revamped to utilize modern handling methods.

The new layout, shown in the three-dimensional sketch, features direct movement of parts from processing through

assembly to shipping. An important factor is the system of overhead monorail chain conveyors, timed (a) to take parts from two separate mechanized processing operations on different levels in different buildings and (b) to deliver them at any point along two separate conveyorized assembly lines located on different floors.

Another feature is a huge tray elevator that solves the problem of vertical flow. It provides continuous automatic movement of product in either direction to any of five floors or direct to shipping dock.

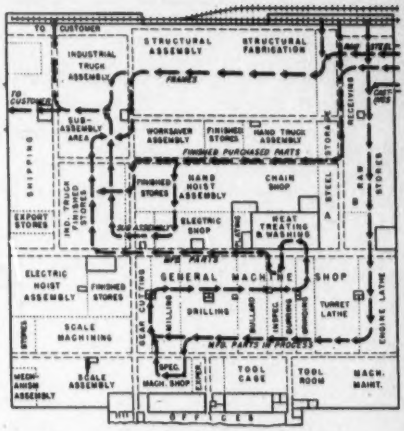
Conveyor Handling System

Range and washer components handled by conveyor are enameled, purchased, and painted parts. Enameled parts are processed on first floor, purchased parts are held in storerooms on upper floors of same building, and painted parts are processed on sixth floor of main building.

Three conveyors move parts to assembly. Enameled and purchased parts for ranges are on one conveyor, those for washers on second, and painted parts on the third. The first two conveyors pass through storerooms on their way from enameling to assembly.

They pass across a bridge between buildings and are parallel to assembly lines at a high level. Parts are removed at two dips and, to protect the enamel, are placed on light pallets resting on roller conveyors that deliver them to workstations on the line. Parts not removed are kept on conveyors in "live storage."

Results from installations were: (1) material kept on move, holding down inventory and saving space; (2) widely separated areas tied together; (3) handling coordinated for manufacture; (4) production-rate inequalities eliminated; (5) congestion because of vertical movement avoided; and (6) greater, low-cost production obtained from same amount of space.



GENERAL FLOW CHART at Yale & Towne shows movement of materials going into manufacture of industrial trucks. Layout and handling are well-integrated.

Handling Determines Layout in New Building

The new Yale & Towne plant in Philadelphia is an outstanding example where good layout and effective handling assure low-cost production.

Handling is the keynote to layout. Storage and manufacturing areas are located to provide a smooth flow of material from receiving through manufacturing to shipping. The accompanying flow chart shows the movement.

Every workstation is placed in proper relation to preceding and succeeding operations. Resulting layout attains the over-all objective of spotting the proper equipment for the best method in a location that permits most efficient processing. It fulfills eight basic requirements:

1. Adequate facilities to receive, inspect, and distribute materials.

2. Short routes to stores and short, direct routes for material movement to initial and subsequent operations.

3. Proper arrangement of equipment

in each department to provide ample room to place material within easy reach of workers.

4. Free access to machines and assembly benches.

5. Grouping of machines and departments to avoid backtracking and needless hauling.

6. Adequate storage facilities.

7. Stockrooms and tool cages with facilities to receive, store, and disperse parts and tools with minimum effort.

8. Facilities to pack finished products efficiently and to ship by all classes of carriers.

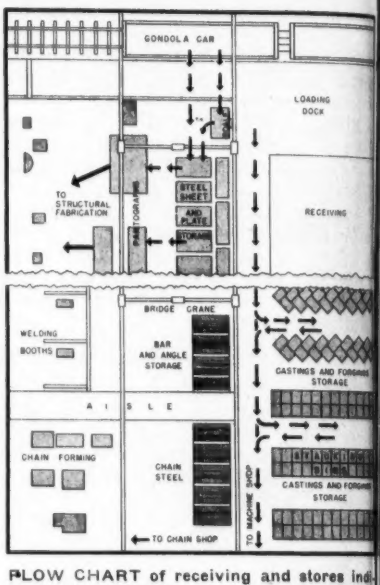
The general production plan calls for parts to be machined and fabricated in economical runs—usually equivalent to several months' requirements. Also, the materials vary widely in physical characteristics and change as they are processed. These factors led to a system requiring materials-handling equipment of three basic classifications.

The first—portable carriers and containers—holds materials on the move, in process, and in storage. These materials are such that they cannot be handled mechanically by themselves. Carriers are skid bins, plain and stacking skids, pallets, trailers, self-dumping bins, dollies, rack conveyors, and special work carriers.

The second is mechanical equipment that includes platform, fork, and powered hand trucks, bridge cranes, monorail chain conveyor, floor conveyors, and monorail hoist installations.

The third is stationary storage facilities to hold loose materials as well as loaded carriers and containers. This equipment includes several types of sectional steel shelving for finished parts and tools, skeleton racks for skidded loads, and miscellaneous racks for raw materials.

The general and receiving flow charts show that over-all flow is short and direct. Frames and purchased parts for industrial trucks move in almost a straight line from receiving to shipping. Manufactured parts take a U-route.



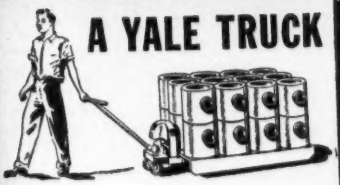
FLOW CHART of receiving and stores indicates that objectives in flow and handling determined relative department location of rough stores and also layout of material within the area.

Raw material is held in rough stores made up of one section for raw steel, the other for castings and forgings. Steel storage area is served by bridge cranes and contains racks to suit each type of material. Castings and forgings are stored in tiered skid bins and are moved by truck to the adjacent machine shop.

Heaviest manufacturing is done in structural fabrication and assembly. These items are heavy and are moved as little as possible—straight through to assembly.

Final assembly is done in six separate departments, one for each major product. Adjacent to each line is a finished-parts stockroom, making it possible to move parts in large unit loads over long routes from either receiving or manufacturing. —Am Mach, D 30, 83

STOP
GET A TRUCK



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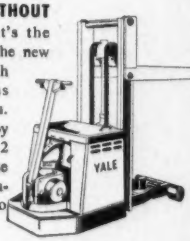

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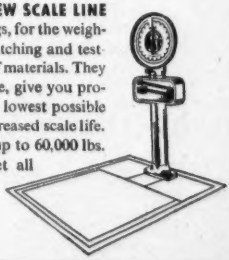

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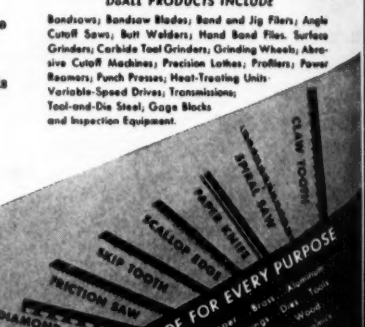

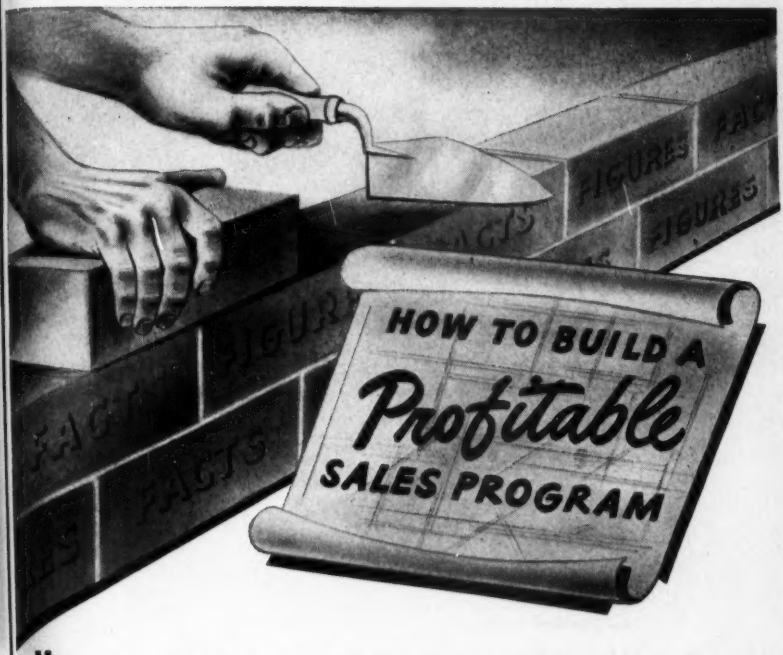

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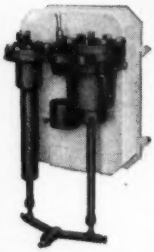

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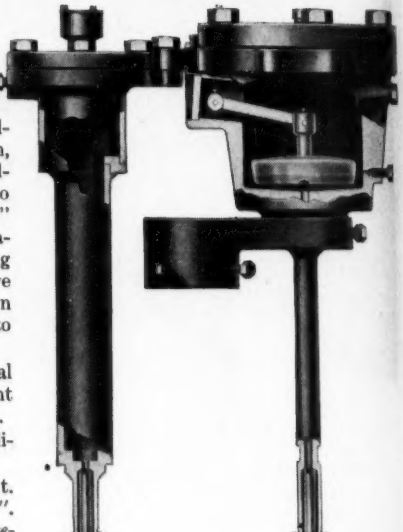

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4. GREAT ADAPTABILITY. (a) *Six interchangeable range tubes:* 10", 20", 50", 100", 200" and 400" of water. (b) *Tubes easily changed* in field without piping alterations. (c) Both side and top pressure connections. (d) *Two Manometers* can be mounted on back of single case for recording two Flows or for Ratio-Flow control.

5. EASE OF MAINTENANCE. (a) *Low pressure chamber cover* permits easy access to float and lever arm during calibration. (b) *Entire pressure-tight bearing* easily, economically replaced.

*Teflon—synthetic plastic used in bearing surfaces—conforms to stainless steel shaft. Also minimizes friction. Because Teflon is inert to most industrial chemicals, bearing surfaces are generally unaffected by corrosion.

If you are not acquainted with your nearest Taylor representative, write Taylor Instrument Companies, Rochester, N. Y., U. S. A., or Short & Mason Ltd., London, England.

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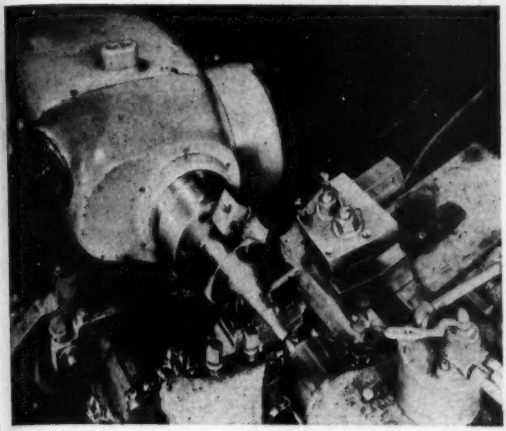

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Here's a typical example: forged steering knuckles finish-machined in 1.23 minutes—*in one setup.* Full advantage is taken of two optional *plus* features: the two-speed main drive motor permits shifting to half speed at any desired point in the cycle—to maintain finish as the tool moves out along the flange. The rear tool slide is timed to lead the front tool slide, performing a roughing cut on the flange to prolong the life of the front tool.

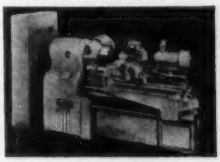
The second plus feature is the automatic feed change—providing up to five infinitely variable feeds, as required. This flexibility of operation allows maximum machining efficiency in the removal of variable stock, so characteristic of forgings.

The Mona-Matic method is adaptable to a vast variety of workpieces; it has made spectacular savings on many a production line. May we show you how it can help lower your own costs?

JOB FACTS

Part—Steering Knuckle
Material—SAE 3135 forging
Operations Performed—Turn stem complete; face flange
Cutting Tool—Carbide Insert
Tolerance—± .001″
Total Machining Time—1.23 minutes.

Note—Two pieces are produced in the above time, as one man operates two machines.



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Monarch TURNING MACHINES

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If economy is important in your plant, the time to find out about machining errors is right at the machine which causes the trouble—not after all the subsequent operations including heat treatment have been completed and the gears assembled in some power unit.

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Unsurpassed for finer crushing of all ores . . .

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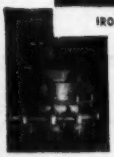
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In addition to Symons Cone Crushers being used by the world's leading metal mines, they are also used for fine reduction of industrial minerals at cement mills and plants producing aggregate from rock and gravel.

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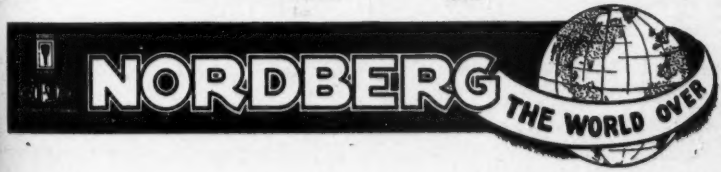

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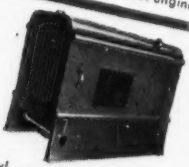
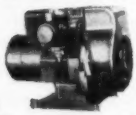

5KW
Four-cyl. gasoline engine powered

3KW
Two-cyl. gasoline engine driven

2½ KW
One-cyl. Diesel engine powered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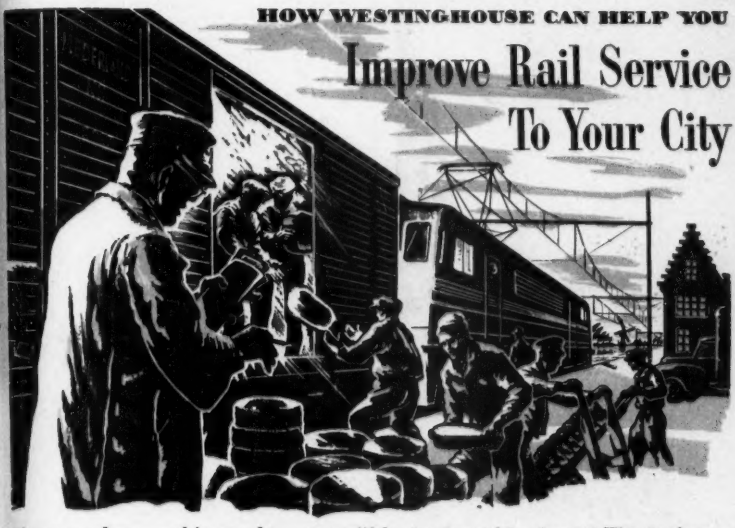
Improve Rail Service To Your City



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Everywhere, the need to move goods faster is vital, yet few countries are able to get needed rail facilities quickly enough. Nevertheless, there are 4 ways in which Westinghouse can help you meet rail transportation needs more promptly:

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3. ***With Complete Locomotive Repair Shops:*** Westinghouse can supply in one unit, and supervise the erection of complete modern railroad repair shops with all facilities including trackage, equipment, service facilities and necessary buildings. The shops can make Class I repairs or new steam locomotives.

4. ***With the Specification and Procurement of Complete Systems:*** Westinghouse is prepared to assume full technical and purchase responsibility for your railway improvement program . . . from original plans and specifications to the operational training of personnel.

For information and help in putting these suggestions to immediate use, call the Westinghouse distributor in your country, or write Westinghouse Electric International Company, 40 Wall Street, New York 5, U. S. A.

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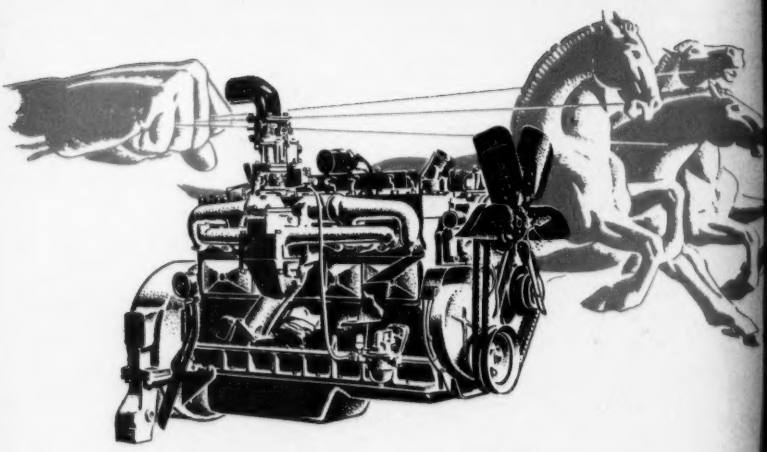

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